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ENGINEERING AND MINING JOURNAL

SEPTEMBER, 1941

Drilling asbestos rock for secondary blasting at Canadian Johns-Manville open-pit mine, Asbestos, Que., Canada

PRICE 50 CENTS

In this issue

The Choco, Colombia: Gold and Platinum Land
Topaz—a New Industrial Mineral and Its Uses
Mining Kyanite in Virginia • Model Change House at Eureka
Operations at Canadian Johns-Manville Asbestos Mine, Part I
Hydraulic Monitor Excavates Mill Site at Baguio, P. I.
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About 1/10 Cent per Ton

for New Parts, in Pumping 3,800,000 tons

One of the first Hydroseal Sand Pumps installed in Canada in the early 1930's, was modernized into an up-to-date Hydroseal Pump and put back in service on July 2, 1938. Accurate records have since been maintained, covering tonnages, repair parts, etc. The "Mill Superintendent" of this prominent gold mining company in the Kirkland Lake District wrote us that up to May 21, 1941, the cost of repair parts per ton of solids pumped was $0.0013, averaged over this period of nearly three years. They handle 3600 tons of solids in 24 hours, at a dilution of 50%; therefore, during 1054 days since the modernization, the Hydroseal Pump has handled 3,800,000 tons. The pulp has a Sp. Gr. of 1.45 and is pumped at 800 U.S. G.P.M. through 65 feet of 6" pipe, the verticle lift being 50 feet. . . . The material in this advertisement was taken from our "Case History" File of Hydroseal Pumps, which records the actual performance of most of the Hydroseals in use. If you would like to know what someone else is accomplishing, under conditions similar to yours, write the nearest office listed below. Catalog 140 sent on request.

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Plastic shoe-string tips will release about 500,000 lb. of metals, principally tin, to vital industries in 1941, according to an announcement by the du Pont company. More than half a billion laces will be plastic tipped this year. One pound of plastic replaces more than three pounds of metal.

▼

Manganese in Chile—Information on strategic mineral deposits in the Western Hemisphere, particularly Latin America, is a vital subject today. In our next issue Fernando Benitez, technical adviser of the Caja de Credito Minero, describes the geology and mining operation, and gives a favorable view for continued production of manganese from deposits now being developed in Chile.

▼

Tunnel Air Filter—To provide better air in mines and tunnels has been the subject of research by R. W. Owens, industrial hygienist for the Industrial Hygiene Division of the Colorado State Board of Health. His new air filter recently installed in the Carlton tunnel has shown encouraging results. This new unit will be described in an early issue.

▼

Alumina Contracts—OPM has concluded new contracts for manufacture of alumina from domestic bauxite. One plant previously authorized at Bauxite, Arkansas, is to be expanded first, and a new plant to have capacity of one-half million pounds of this raw material per year is to built at another site in the same State. Thus the aluminum industry will depend more than ever on domestic production. The plan to make aluminum from alunite in Utah is being considered as a semi-works project proposed for Marysville.

H. C. PARMELEE
Editor

ENGINEERING AND MINING JOURNAL

H. W. CLARKE
Vice-President

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9 GIANT NEW STORAGE

HAULING COPPER ORE by the trainload is the job of this 125-ton storage battery-trolley locomotive, equipped with a 240-cell Exide-Ironclad Battery. It is the first of nine locomotives built by Westinghouse Electric and Manufacturing Co., Pittsburgh, Pa., for use in Phelps-Dodge Corporation's open cut mine at Morenci, Arizona.

TODAY at Morenci, Arizona, there is an open cut a mile in diameter, where a short while ago the top of a mountain stood. A great copper ore body lies open to daylight —and across its face are miles of railroad much of which has to be continuously moved as the cut is widened and deepened. Upon the tracks on the sides of this great mine there is now in service a fleet of 125-ton battery-electric locomotives.

These locomotives are the most powerful of this combination type ever used for open cut mining. Each of the nine locomotives, built by Westinghouse Electric and Manufacturing Co., Pittsburgh, Pa., is equipped with an Exide-Ironclad Battery of 240 cells, rated at 500 ampere-hours, which supplies the power needed for traversing the working benches.

When a locomotive reaches the main line, its pantograph is raised and power is obtained through the trolley wire. Power from the same line is used to recharge the Exide-Ironclad Battery in the locomotive and the recharging is controlled from a special charging panel.

Phelps-Dodge Corporation, like many other mine operators, specified Exide-Ironclads for mine locomotive service because these batteries have proved their outstanding dependability . . . in power for handling heavy loads and steep grades . . . in maintaining high voltage for fast runs . . . and in satisfactory performance year after year.

ENGINEERING AND MINING JOURNAL

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Through Enemy Action

WORD REACHES US that indiscriminate bombing in London has deprived of their premises two organizations closely identified with the mining industry throughout the world. The Mining and Metallurgical Club asks us to inform members and friends in the United States that restoration of its quarters is proceeding as rapidly as possible and that the appeal for financial assistance has had a satisfactory response. In the interim the Chemical Club and the Clements Club offered hospitality to members of the Mining Club, and the Institution of Mining and Metallurgy granted temporary office accommodations. The other victim of enemy action is Walter E. Skinner, publisher of the Mining Year Book, who asks secretaries of mining companies to note that his present address is 20 Copthall Avenue, London, E. C. 2, where annual reports and other pertinent documents should be sent.

Critical Copper

IT CAME AS A SURPRISE, even to many in the industry, to learn of a critical shortage of copper for military and civil needs. Current estimates of domestic supply for 1941 include: primary production, 950,000 tons; secondary recovery, 100,000; from Canada and Mexico, 100,000; through Metals Reserve Corporation (South America and other), 500,000; total, 1,650,000 tons. Defense needs are set at 1,000,000 tons, and civil industry is expected to want 880,000 tons. Result: a shortage of 230,000 tons for 1941.

The outlook for 1942 is little better. Probably primary domestic production can be increased 150,000 tons, of which about half would come from increased activity at Morenci and half from marginal mines in different parts of the country at a price somewhere above twelve cents a pound. Whether Latin American supply can be maintained or increased depends on shipping conditions, as does the possibility of getting copper from Rhodesia. Defense requirements are certain to increase substantially, so civilian uses are equally certain to be curtailed.

After Twenty-two Years

JUST IN TIME to clear the way for a new crop of claims growing out of the present war, the War Minerals Relief Commission wound up its affairs on June 30, 1941. Even Congress wearied of amending and liberalizing the War Minerals Relief Act of March 2, 1919, and directed last year that claims not prosecuted and disposed of prior to July 1, 1941, should be barred. So it took twenty-two years to clean up the claims growing out of official encouragement to produce minerals and metals for the first World War. In that interim successful efforts were made to liberalize the language of the original act so that almost anyone who had been asked by almost anyone to engage in mining pyrites, manganese, chrome, or tungsten could get consideration and receive an award. More than ten million dollars of government money was thus disbursed—an impressive sum years ago, but a bagatelle today. In the light of this experience it is unpleasant to contemplate claims for war-minerals relief growing out of the present war. Some will be genuine, but others will be questionable; and the latter will have vitality in inverse ratio to their validity. They will be the problem of the next generation.

Tin Fiasco

HUMAN NATURE BEING WHAT IT IS, and more so at some times than others, one would naturally expect the defense program to stimulate a lot of "important" mineral discoveries, particularly of strategic materials. So we were not surprised some weeks ago when a visitor wanted to advertise in *E. & M. J.* a Western tin property and a process for recovering the tin. He would disclose neither the location of the property nor the nature of the process, but we gathered that they were complementary. Without the process it would be impossible to find tin in the rock, so both had to be advertised and sold together. We declined the business, whereupon our visitor complained that "you scientific fellers are all alike, you don't believe anything you don't already know." And he departed with pity for our ignorance, and assurance that he would return with evidence of an established industry. Then we would be sorry we had spurned his proposal.

Subsequently the pother over the so-called

Burns tin episode in Oregon reminded us of this experience, because there again we found the familiar pattern of a fiasco: earnest promoters; clever manipulators of a special process; a group of "scientific fellers," who, although mystified by the hocus pocus, still didn't believe it; and violent partisanship and sharp words on both sides of a hot controversy. It has all happened many times before and will happen over and over again. It has ceased to be diverting and leaves us cold.

Despite our visitor's deprecation of "scientific fellers," there is increasing reason to rely on science in determining the presence or absence of a metal in a rock. The spectroscope gives conclusive evidence. So when reputable analysts in private practice and in government laboratories use this instrument of precision we accept their findings against those of adroit operators of special processes. Especially unimpressive is the claim for recovery of tin by a volatilization process from rock that yields no spectrum of tin when volatilized in the electric arc.

Washington and Defense

A FEW DAYS SPENT in Washington about the time this is written would give the visitor a kaleidoscopic glimpse of democracy muddling through the biggest business on earth —preparation for military defense of the United States and aid to victims of Axis aggression. No offense is intended in the reference to muddling, because we prefer democratic muddling to autocratic efficiency. Nevertheless, some things could be done better. Thus, one finds the White House concerned over the general apathy of the public, and the lack of enthusiasm in the drafted army. At the same time, with the defense organization marked by internal controversy, and crying aloud for single leadership, Mr. Roosevelt appoints a seven-man board—a gesture that straddles the issue and fails to inspire confidence. Controversy between business men and New Dealers in the defense organization can now proceed within a board instead of between separate groups.

And speaking of those two groups—patriotic business men and zealous New Dealers—one finds the latter not single hearted in going all out for defense, but ever mindful of partisan aims. They follow the lead of the President himself, who insisted long ago that in planning defense we must maintain our social gains. The situation is summarized by a Washington observer in the paraphrase "reform as usual."

All of which, of course, is futile; as much so as to presume to run the defense program "with business as usual"; which, incidentally, was also a feeble contention of some of the lesser lights in the Administration during the early days of the war. To the contrary, *Engineering and Mining Journal* has from the beginning of the defense effort repeatedly taken the position that not only could we not have business as usual now, but that it would be a long time, if ever, before we would return to what we had considered a normal way of life.

For confirmation of the fact that we cannot have guns and butter one has only to look into the priorities system in Washington, which is temporarily in deep water and must be rescued and revamped. However reorganized, it will continue to develop shortages of supplies for civilian industry that are certain to get worse as time goes by. To a degree, the priorities system has worked something like prohibition—nobody took it seriously and everybody tried to beat it. So if the Government now wishes private industry to believe the shortages and cooperate in the priorities program it will have to publicize conditions more frankly and pass out factual information that will convince and satisfy. Just now we feel that priority orders are inflated beyond capacity to consume, with the result that shortages are magnified beyond belief; but we also believe that more critical shortages are coming for which the Administration has not adequately prepared civilian industry. Even metal-mining companies will be well advised to assure themselves of equipment and supplies vital to continued operation, without relying indefinitely on the A3 preference rating given to manufacturers.

Summarizing these Washington observations: the defense effort needs a single business head but probably will have to get along with a board on account of the President's well-known distrust of business men and his desire to control every activity; controversy between industrialists and New Dealers in defense organizations will continue to impede, but not seriously delay, the defense program; business men and industrialists will be the target of New Dealers as long as Mr. Roosevelt is in office, despite the fact that he is dependent on the former for the success of the defense program; dislocation of civilian industry by shortage of supplies due to priorities will get much worse rather than better and will call for new measures of cooperation if the people are to accept inevitable hardship and sacrifice; the Government's problem is to persuade and induce the people to accept the rigors of a war economy without being actually at war. In our judgment we have seen and heard only the beginning, but we believe democracy will yet muddle through.

Reflections from Washington

By Special Correspondent

WASHINGTON has generally failed to realize the fundamental shift in American philosophy implied by some of the eight points agreed upon by Roosevelt and Churchill in their Atlantic conference. The combination of abundant supply of raw materials and new trade philosophy would, it appears, necessitate practically a free-trade plan. It is doubtful whether the Senate of the United States would accept that idea. Certainly Western Senators interested in protecting the mining industry from indentured and low-paid labor of much of the rest of the world will have a great deal to say about that part of a permanent peace plan for the Democracies. It will be Roosevelt vs. the Senate, just as it was Wilson vs. the Senate on the League of Nations. And the Senate is likely to win.

Machinery and Maintenance Priorities

CONSIDERABLE DIFFICULTY is being experienced by many builders and would-be purchasers of mining and smelting machinery. Relatively little trouble has been met in maintenance and repair programs. The priority rulings authorized in July to care for such cases, though subsequently modified, are working out fairly well. Delays are frequently reported, but problems are not more serious than most would expect under the circumstances.

More serious difficulty is encountered where a new plant or plant expansion is desired. It sometimes takes considerable time to extend manufacturing priorities back to the needed machinery and equipment. The principle, however, is simple. A priority on the government contract for the supply of any device, machine, or commodity may be extended back to the raw materials or to needed machinery or equipment.

That is a very simple plan in statement. But to make it function effectively is not by any means simple or easy. Mining and smelting executives can, however, depend on the plan being enforced, if they are persistent enough in pressing their equipment needs at Priority headquarters.

But regardless of whether a firm has a priority or not, there always remains the question of date of delivery of equipment. Recently one shop was quoting 15-month deliveries on A-1-a priority orders. Representatives of the firm explained that they had a comfortable amount of business for some months which rated A-A, and enough more of the next rating, A-1-a, to keep them busy through the next calendar year with all the men and manufacturing facilities which their shops afford. That extreme example is being duplicated in a less drastic form in thousands of other equipment establishments, it is reported. The equipment builder can, however, get raw materials for his building of machinery and facilities without too much difficulty unless he needs the ultra-scarce light metals like aluminum or the ferro-alloys containing nickel and chromium.

Metal Inventory

A COMPREHENSIVE INVENTORY by the Bureau of the Census will determine the stocks on hand and current rates of consumption of 65,000 industrial establishments. The metals covered by the inquiry are: Antimony, cadmium, chromium, cobalt, copper, ferro-alloys, iridium, lead, manganese or spiegeleisen, mercury, molybdenum, nonferrous alloys, tin, vanadium, tungsten, zinc, and scrap metal containing any of these.

Each firm receiving the questionnaire is required to make a prompt return so that a tabulation can be prepared. Only composite figures can be given out under the Census law. But replies can be made compulsory by the Census Bureau, which is presumably one reason that OPM and OPACS are using that government agency. It is anticipated that the composite of these returns will cover 90 percent of American activity in use of the named metals. Then the considering of imports, stockpiles, and current requirements will permit a more accurate appraisal of metal scarcity and metal needs than has hitherto been possible.

It was expected that another questionnaire would be sent out to *dealers* in metals about the first of September.

Without waiting for completion of its inventory, OPM has fixed a preference schedule which it requests metal-using industries to observe. It suggests that when a variety of metals might serve a given industrial purpose, the user-industry should employ the one farthest down on the following list which will adequately serve the purpose intended. The lower a commodity is on the list the less likely is it that scarcity will interfere, officials think. The sequence is: Magnesium, aluminum, nickel, copper, zinc, lead, iron, and steel.

Price Ceilings

FIXING OF MAXIMUM PRICES for metals gained much momentum during August. The informal agreement regarding copper prices has crystallized in a definite official order of OPACS which became effective Aug. 12. The top on tin prices was set three days later. And at the same time, warning was issued regarding quicksilver prices. The following day lead scrap price came under the critical fire of OPACS Director Henderson.

Twelve cents ceiling price for copper in effect cancelled a number of earlier commitments for metal made at higher levels except under limited circumstances indicated in the order. The right of appeal of "persons complaining of hardship or inequity" was, of course, recognized; but few modifications are anticipated. Trade practices for penalties and bonuses on various kinds, grades, shapes, or forms were continued in force as variants of the 12c. base price. Differentials for small quantities were also recognized. It is well understood in Washington that substantially higher price for copper will be paid to marginal or submarginal producers who may contract with Metals Reserve Co. Presumably the metal so purchased by the government will later be distributed at the OPACS price level for use in government contracts.

A price ceiling of 52c. a pound on "Grade A" pig tin is fixed in a formal OPACS order of Aug. 15. Exemptions under certain conditions were permitted on firm commitments entered prior to Aug. 16 for pig tin at prices above the new schedule. As in the case of copper, various differentials are allowed for grades, shapes, and types of material. And there is no effort to compel sales at the maximum prices named in the official schedule. However, Washington does not appear to expect that any great amount of business will be done significantly below the maximum.

The price warning on quicksilver and the criticism of hoarding and price advances of lead scrap were expected to be followed by more formal action late in August or early September. In both cases, as official prices are named it is anticipated that they will be well below the maximums prevailing during this speculative period.

Magnesium Contract

AT UNEXPECTED SPEED the negotiations of Defense Plant Corp. with Basic Magnesium, Inc., came to conclusion the middle of August. It was announced on Aug. 13 that the government had signed a contract of $63,000,000 to permit Basic Magnesium, Inc., a subsidiary of Basic Refractories Corp., to build a huge magnesium plant in Nevada. The exact site was not announced at the time the contract was closed.

The projected plant is to have a rated capacity of 112,000,000 lb. of metallic magnesium per year. It will use Nevada magnesium minerals as raw material. The electrolysis of magnesium chloride produced from such mineral will be by English methods with which certain engineers of this contracting company are thoroughly familiar.

The successful execution of these plans will provide from this single source a trifle more than a quarter of the required metallic magnesium, according to present official estimates. Up to the end of August the government

had not announced the completion of its negotiations between Defense Plant Corp. and the various electrochemical firms which have been expected to have an important part in the required magnesium business. It was still expected, however, that Mathieson Alkali, Michigan Alkali, Diamond Alkali, and Union Potash companies would become magnesium producers sometime during the first half of 1942.

Unofficial reports in Washington were that the first unit of the Hansgirg process plant being built by Permanente, near Palo Alto, Calif., was put into initial operation during the last week of August. The results of this first trial will determine the form and the timing of the construction of the other four or five units which are projected.

Limit to Supplies

UNTIL LATELY Washington has proceeded on the assumption that almost any quantity of material or manufacture could be arranged by the government with its unlimited funds for contracts. For some time that philosophy worked. But this summer seemed to produce a saturation of business possibility with a large number of the divisions of industry. For example, there seems to be no immediate possibility of getting more zinc or lead and little more copper, say in the remainder of 1941, no matter what promises or plans the government is willing to approve. Even the generous contracting for aluminum and magnesium and other such metals seems to have gone about as far as the government negotiations can carry. The same thing is true of guns and tanks and planes and all the rest of the mechanical requirements to serve four million fighting men in the field.

Secondary effects of huge contracting activity have suddenly developed on an appalling scale. Large numbers of small companies may be put out of business because the priority allotment of raw materials for military purpose is completely exhausting supplies. No longer can firms needing iron and steel, non-ferrous metals, or many chemicals and plastics be supplied promptly. Thus, many small firms, and some big ones, without defense contracts are faced with shutdown or curtailment of activity within the next few weeks.

Congressmen are hearing of this. They reflect the distress back home in caustic comment at the headquarters of OPM, OPACS, and the White House. They get small comfort there. A wave of indignation appears, therefore, to be rising in legislative circles. Only the series of recesses of the House, while the Senate works on the tax bill, appears to have averted a tumultuous August uprising against present defense programs.

When Congress returns to regular duty the middle of September, something is likely to happen, as things look at the end of August. Meantime, close advisers of the President are urging that drastic measures be taken to speed up the defense reorganization. The naming of some top authority to coordinate the present conflicting activities is "demanded," but neither the President nor other high executives seem to know where they can turn for that one strong man who will be both acceptable and forceful enough to take over this job. Certainly the President cannot handle it, because of the multitude of other responsibilities which cannot be delegated to anyone.

New Tax Burdens

THE MINING INDUSTRY is especially interested in certain phases of the tax law as it is now being formulated by Congress. In addition to the general burdens which they will share with all the rest of business, the mining and mineral industries have certain special problems.

Of most direct concern among the special problems is probably the question of tax on strategic minerals. The development of tungsten, quicksilver, platinum, manganese, antimony chromium, and tin has in certain cases been undertaken with the understanding that there would be no excess-profits tax on the new operation. As passed by the House during early August, the new tax bill would remove this exemption. Naturally there has been vigorous protest from interested mining industries. Whether the Senate, usually much more responsive to mining pleas, will restore the exemption and be able to vote it through Congress is an important question at the beginning of September.

Business spokesmen continue to emphasize to Congress comparisons between British and American taxes. The Chamber of Commerce of the United States has formulated figures to show that "the tax burden in the United States is just about equal to the British tax burden, whether measured as a per capita burden or as a percentage of national income." But this argument is not enough to offset the insistence of Federal authorities on raising by taxes a larger percentage of the money needed by Uncle Sam.

The broadening of the tax base, by lowering of personal tax exemptions, is the simple remedy offered by the Senate for the House cancellation of compulsory joint tax returns of husband and wife. That new levy, bringing in millions of new Federal taxpayers, is much more likely to be accepted than the other alternatives. But later this year or early next, Congress is likely to reconsider, and may enact, larger payroll taxes, retail sales taxes, manufacturers' sales taxes, or other new burdens generally applicable. Those, if imposed, will bear no more heavily on mining than on any other business—possibly less heavily. Perhaps the most persuasive argument in Washington for these heavier taxes is the necessity of doing something to offset the obvious inflationary trend which is seriously disturbing every sort of Congressional leader.

"New Fines"

"D" Day 1944—Planning agencies of Washington are officially preparing on the assumption that the war will last through 1943. This means that our post-emergency programs are dated 1944 and following.

Metal Price Stability—Washington notes with satisfaction the fact that of all important commodity groups, metals and metal products have advanced least in price during the past twelve months. Official figures of mid-August indicate that a 4 percent rise in this commodity group was only one-quarter of the average percentage rise for all commodities. The mining and metal industries are complimented. But the government is strangely silent regarding the advance in the prices of farm products, which amounted to 32 percent.

Silver Purchase—Mining-state members of the Senate were not at all pleased by some August comments of Secretary of the Treasury Morgenthau. When pressed by Senator Vandenburg, of Michigan, he admitted that the Treasury would not object if Congress were to do away with all silver purchasing legislation. It is not expected that either the President or the Treasury will press that point. But the possibility that silver subsidy might be dropped worries some of the members of Congress.

Is It Consumption?—Washington does not believe that all the present disappearance of metals represents actual consumption. Officials hope to find out about this when they get the results of the Census inventory, which will show not only stocks on hand and in process but also actual consumption according to the purpose served.

For the Mining States.—Many cities in the Western mining states are being sadly demoralized by departure of skilled workers from these communities to take defense jobs elsewhere, notably on the West Coast in the aviation industry. This has occasioned a series of hearings under the leadership of Senator O'Mahoney by the Senate public lands committee. The hope is that further industrialization of Western minerals and the establishment of new industry throughout mining states may tend to offset this drainage of skilled labor. Any mining or metallurgical enterprise which has ideas that may be helpful would be welcomed by the Senate committee as an aid in solving this critical problem.

Work Time—The Federal District Court has supported the Wage-Hour Division of the Department of Labor in the definition of working time at mines. The time that an employee is engaged, as calculated under the law, is to be portal to portal, in accordance with the opinion of Administrator Fleming of last March. This has been fully described and interpreted in the pages of *E.&M.J.* previously.

Tariff Cuts—Spokesmen of the mining industry are pressing vigorously on Senators and Congressmen to prevent enactment of the House proposal regarding cutting of the tariffs on imported materials needed for defense. The fear is that elimination of these tariff burdens may not be temporary, but may furnish a basis for "free trade" action in post-emergency years. Spokesmen of the industry, therefore, ask, first, that any tariff cuts be made temporary; second, that the tariff cuts be authorized only for those commodities which some single high defense agency shall determine are truly "defense" necessities.

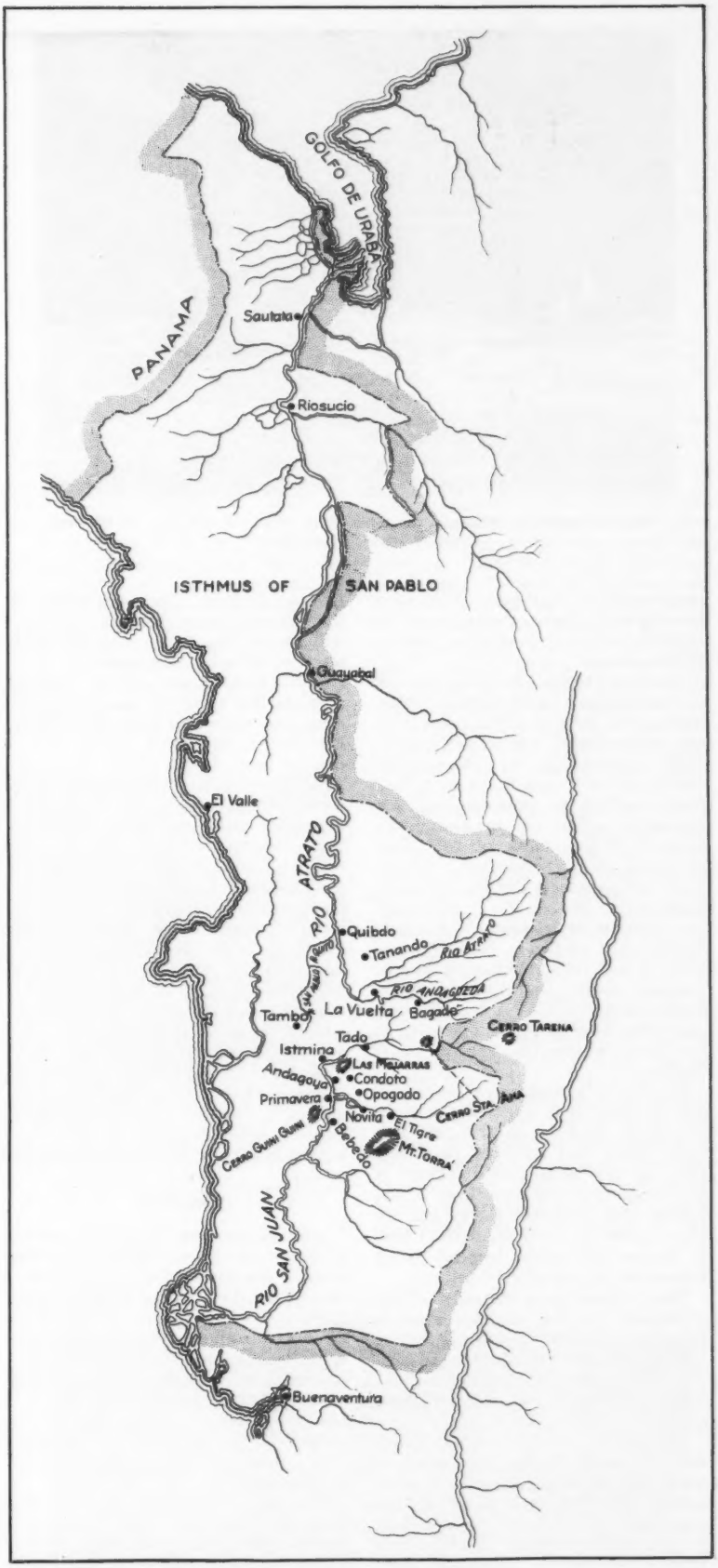
In the CHOCO Colombia

Alluvial deposits of gold and platinum worked principally by primitive methods; also by dredging. Large areas of land still unexplored

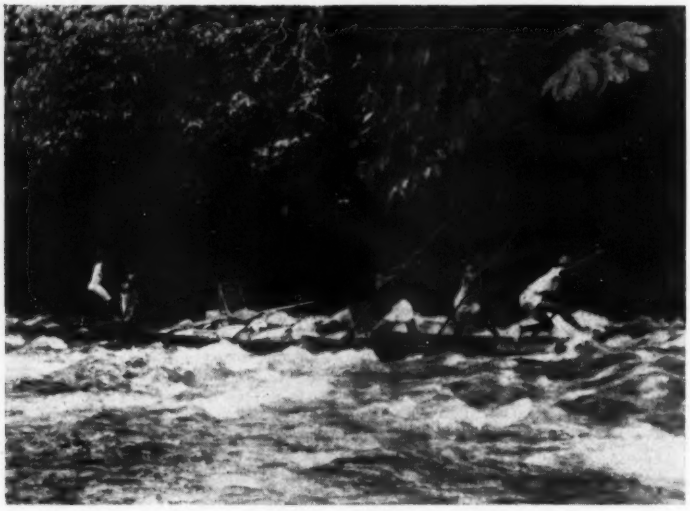
Andrew Meyer
Mining Engineer

IN THE YEAR 1513 Vasco Nunez de Balboa wrote to his king: "Going upstream on this great river (Atrato) there is a province on the right bank called Abanumaqui. I have reliable information that there are rivers in that province very rich in gold."[1] The gallant discoverer of the Pacific Ocean was correct to the tune of $420,000,000, this being the estimated value of the precious metals which the Choco has produced from its conquest to our own days.[2] That "province" of Balboa's is a part of the Intendencia Nacional del Choco, which in its turn is a part of the Republic of Colombia, South America. It occupies about the same position in the political scheme of things in Colombia as one of the territories in our own national life.

During the second half of the last century there was considerable interest in the Choco as a possible site for a sea-level interoceanic canal. The famous civil engineer, Trautwine, was greatly impressed by the showings of some of the mines he had seen. Those were the heroic years of American mining and some of the backwash of California found its way to the Choco. Men with money took notice when the glamorous reports of Robert White, an English engineer, reached them. White stated that the conglomerates near Novita held from one to two ounces of gold and platinum per cubic yard.[3] Perhaps he meant to say alluvials, because there is nothing in the conglomerate bedrock anywhere in the Choco except what might have



Map of Intedencia del Choco, Colombia. Shaded area indicates part discussed by the author



Taking the author's supplies up the Agua Clara. One of the reasons for the high cost of mining in the Choco

been caught in the cracks. Subsequent investigations have shown that the alluvials are not nearly as rich as White claimed.

The first attempts at dredging were dismal failures. Three suction dredges were tried between 1882 and 1885,[4] and a dip bucket dredge was used in 1901. From 1922 to 1929 a steam dredge of the British Platinum & Gold Corp. worked in Opogodo, but was abandoned when the increasing distance from the source of fuel made operating costs prohibitive. A few years ago another English company, Andagueda Mining Co., prospected some benches near Bagado in desultory fashion and suddenly ceased operations. About 1938 an American mining company started work in the Negua River below Quibdo, and is the only successful enterprise now operating in the Choco besides Cia. Minera Choco Pacifico.

The Choco is essentially the northern half of the Pacific coast of Colombia. It extends from the mouth of the San Juan River, just north of Buenaventura, to the borders of Panama. It has three river valleys; those of the Atrato, San Juan, and the Baudo. All three rivers are navigable. The Choco is covered by thick tropical forest typical of the torrid rain belt.

The overwhelming majority of the population are Negroes. According to the census of 1938, of the 111,684 inhabitants, 7,660 are classified as Indians. Of the rest 90 percent are Negroes of various types and shades of color.

There is not a single completed road open to vehicle traffic. The road between Quibdo and Bolivar is now in construction, and it is hoped will be completed in two years. Another one is projected between Quibdo and Istmina. Of its 76 kilometers about half is finished. The importance of these roads lies in the fact that they will connect the Choco with the much more progressive Antioquia.

The Choco is one of the rainiest spots in the world. In some ways the rains are a nuisance but they bring high rivers and much needed heavy cargoes from the sea ports. They also flush out the native villages and sluice away the breeding pools of malaria mosquitos and other pests. The dry season inevitably brings sickness and fever to the natives. Local doctors are expert in treating fever, but one relies on sanitation and simple personal hygiene as preventatives. Taking 1938 as a fairly representative year in Andagoya: there were 302 rainy days, 280 inches of rainfall; humidity was 80, vapor tension 22, average maximum temperature 32 deg. C.., and average minimum temperature 22.5. Since the sky is usally overcast, heat is not excessive. The humidity is high and it is bad for those who suffer from bronchial troubles. Clothes and leather goods are quickly damaged by mildew.

Geology

Geology of the Choco has been studied very little. What is known about it was gathered by people on the run, so to speak. One probable reason for this lack is that the only economic minerals, gold and platinum, occur in placers. Yet the Choco has other mineral possibilities in hard-rock mining and oil. The following observations are based on various sources derived from scanty notes of geologists and engineers, and rounded out by limited personal field work.

The main tectonic features of the Choco are the Western Cordilleras, the geosyncline of the San Juan-Atrato valley, the Baudo range, and the Torra uplift. The great Andean uplift started in the Cretaceous period and continued in the Tertiary era. Gradually the Cretaceous geosyncline changed into the geoanticline which is the backbone of the Colombian Andes. The Tertiary Pacific Ocean beat against the western slopes of this uplift, but the Andes continued to rise and finally the Tertiary sea bottom was pushed up. This bottom now forms a series of conglomerates, dark-blue sandstones, and gray shales. In these gray shales one finds fossils of snails, clams, carbonized wood, and leaves very much like those existing in the present swamps. Probably they belong to the Oligocene period. In only one place did I find partially marmorized limestone in the strongly folded shales near Pachito, in the San Juan valley.

The Miocene was a time of volcanic activity. In fact this activity continues in our own time. On the western slopes of the Andes outcrops of volcanic rocks are common; so are they at the base of Mt. Torra. It is possible that the upward buckling of the Baudo range is connected with volcanic activity. The existence of hot springs on the Pacific Coast seem to indicate this. The resulting geosyncline between the Andes and the Baudo forms the San Juan-Atrato valley. At first it must have been more like a shallow sea, or basin filled with luxuriant vegetation, for there are peat beds west of Istmina. Later this basin-like depression was filled with gravel by streams emptying into it. In some places this ancient gravel, locally known as *caliche,* approaches kaolinite in composition, but still preserving the form of the pebbles from which the feldspar has been leached. An occasional obsidian boulder is the only unaltered rock in the mass. There are large *caliche* deposits around Condoto, in the valley of the Quito River, and near Quibdo. They contain no precious metals, but more recent alluvials overlying them do. Therefore it may be assumed that mineralization took place between the formation of the *caliche* deposits and the laying down of the metalliferous alluvials. In other words a period of quiet was followed by more tectonic changes coupled with mineralization perhaps in the Pliocene period. The new uplifts gave force to the waters which carried their load to the *caliche*-filled basin and dropped it there. The distribution of the platinum gives a clue to the course of the Pliocene rivers. Table I gives the approximate ratio of platinum and gold in the various districts of the Choco.

This comparison shows the distribution of the platinum along the valleys of the San Juan and Atrato, but these rivers lie on the opposite side of the present watershed. This watershed in fact is the continental divide and obviously was raised after the deposition of the platinum-bearing gravels. The

coarsest platinum nuggets with black chromite of the mother rock still clinging to them are found in the Curoro Creek, a tributary of the Condoto, and we may assume that the source of a great part of Choco platinum was near there. Serpentinized basic intrusive rocks are known to exist there, though every search for primary platinum deposits has ended in failure. The platinum-rich Opogodo-Condoto alluvials might have been formed from rocks related to these intrusives. Another probable source of platinum is the region around Mt. Bochoroma, in the upper San Juan country. From these two probable sources the platinum was carried into the Quito valley. Note that the Andagueda which is much nearer to Mt. Bochoroma than the Quito has only 1 percent platinum in proportion to gold. The inference is that the ancient platinum-bearing streams did not drain into the Pacific but swung northward at the western slopes of the San Pablo hills.

There are great structural differences between the Atrato and the San Juan valleys. Both are underlain by the Pacific formation and rock series in them are very similar in composition. There is one important difference: the strike of the formation in the upper part of the Atrato valley is N.-S. and the strata dip gently toward the west, the dip increasing rapidly on the flanks of the Andean range. On the San Juan side the strike is about N. 40 deg. E. and the dip is nearly vertical. On one side of the low divide the rocks are almost flat and on the other side they are intensely folded; furthermore, the San Juan valley is higher than the parallel Andagueda valley. Such abrupt transition in structure can be relieved only by a fault. One is known to exist near Bagado, which possibly extends to the Pacific ocean.

The cause of the folding of the rocks on the San Juan side was the disturbance created by the uplift of the great igneous mass of Mt. Torra. The bearing of a line drawn through Mts. Tarena and Torra is N. 40 deg. E., or the same as the prevailing strike of the rocks of the region. Parallel ranges exist such as the hills called Majarras and Guini-Guini. These are really parts of the same residual anticline. Once the San Juan flowed on the west side of both of them, but later it eroded its way through them and swung its course east of Guini-Guini. From a plane several of the parallel fragmental folds can be seen. The region west of the San Juan is the mostly likely place for oil geologists to investigate.

The Pleistocene period was one of cold climate. Glaciers descended as low as 8,000 ft. above sea level. The present glacial limit in these latitudes is 13,000 ft.[5]. I observed terminal moraine composed of angular dioritic rocks and unstratified boulders near Las Angosturas, in the San Juan valley, and near Badago, in the Andagueda.

As we have seen, the Torra uplift changed the course of the rivers and had given a new impetus to them. As a result the older gravels were resorted and the present flats, terraces, and benches were formed. It appears that the Torra-Tarena uplift continued through the Pliocene and Pleistocene periods and frequent earth tremors indicate that the process is still going on. These were also mineralizing periods. There are a large number of veins containing gold, silver, copper, lead, and zinc along the contact zone of the Western Cordilleras. They are known to exist in the headwaters of Rios Sucio, Murindo, Bebara, Icho, and the Andagueda, on the Atrato side. On the San Juan side there are quartz veins near Mumbu, Rio Mondo, in the upper Condoto near Santa Ana, in the Tamana valley near Sed de Cristo, and on the flanks of Mt. Torra.

The contact zone is made up of granite, andesite, greenstone, and metamorphosed sediments.[6] Only two of the known deposits are worked. One near the town of Frontino, belonging to Antioquia, and one near the headwaters of the Andegueda, in the Dabaibe mine. The Colombian government ought to send some of its young engineers and geologists into these virtually unknown areas under the direction of an experienced field geologist. Here they would gain much needed practice and at the same time help to open up the country to industry and progress. When we consider the great quantity of gold and platinum which was produced in the Choco for almost 300 years we cannot escape the thought that the veins which had been their source must have been rich and numerous. Table II[7] gives the production of gold and platinum for a period of five years.

From Rio Sipi northward to the Gulf of Uraba all the streams on the eastern bank of the San Juan-Atrato system carry gold and platinum in varying degree, and some on their western bank as well. About 30 miles from the headwaters of the rivers gold becomes too fine to save, but platinum travels from its source much less distance and it never becomes so flaky as gold. Thus mining activity is limited to the upper reaches of the rivers, especially to the flanks of the Isthmus of San Pablo.

The simplest form of native mining is washing beach gravels after high water. The swollen streams carry flake from banks and gravels upstream and deposit them where the flood waters spread out over the submerged beaches. The most productive weather for this

Natives mining a bench in Santa Lucia Creek

No. 4 dredge in the Andagueda River near La Vuelta

kind of work is the dry period. The scanty waters of the rivers permit the natives to divert a part of the stream from a favored spot and to dig down to bedrock. If the water is more than waist deep these submarine miners tie boulders on the small of their backs to keep them under water. The rock is called *lichigo*; the name of the sickle-shaped scraper with which they loosen the gravel is *almocafre*. The gravel is scooped up with two quarter-orange-peel-like *cuchos* grasped in both hands, and concentrated in a wooden *batea*. A three-pronged branch is stuck in the bottom of the stream near the miner to support half of a calabash, into which the concentrates from the *batea* are poured. Native miners do all their river mining with these primitive tools. For ground sluicing they add a shovel-bladed crowbar to cave down the bank. They do not know how to use shovels, wheelbarrows, or pumps. Some of the local merchants rent small gasoline pumps to the miners on 50 percent participation basis, and some daring souls experiment with wheelbarrows, but they invariably revert to the good old *batea* and *almocafre*. On the other hand they are clever in damming streams and in carrying water long distances in ditches to their mines. Their earnings range from $0.10 to $1 per day, with the average hovering about $0.20 a day. Their needs are few and their ambition is even less, so they get along quite happily. Yet, through their cumulative power they produce more precious metal than the Choco Pacifico's electric dredges. During the second half of 1939 production was divided as follows:[5] By modern methods, $399,857.80; by primitive methods, $685,121.10; total, $1,084,-978.90.

Minas de Negua is the only company in the Choco using modern methods besides the much larger Choco Pacifico. It is an American enterprise managed by L. L. Lewis. The camp site is called La Concepcion and is near the village of Negua, on *Rio Negua*. The mine is in the valley of the Negua and to work in the channel or in low places it is necessary to dam the river. Sometimes the dam breaks and the workings get flooded. Under an overburden of compact there is 10 to 15 in. of loosely cemented gravel pay dirt. Bedrock is almost level.

The mining method is ingenious and well suited to local conditions. A sump is cut into the decomposed bedrock and a portion of the flat is dammed behind the sump. The clay is broken down and washed away by high pressure water and the thin layer of pay dirt is sluiced into the sump. From the sump the gravel is lifted into a 40-ft. sluice by a suction pump. Pump and sluice are mounted on a barge which floats above the sump. As there is no natural high-pressure water in the vicinity, diesels are used to drive the pumps. Costs are said to aggregate about 50c. a cubic yard. This high cost is due largely to expensive fuel. A drum of diesel oil costs about $9 American, in Quibdo.

A long haul from Quibdo by canoe adds considerably to the cost of supplies.

Cia. Min. Choco Pacifico is owned by the Lewisohn interests, represented by the Colamer Co. of New York. General manager is N. C. Marshall. The center of activity is at Andagoya under the direction of F. M. Estes, assistant manager. The superintendent of operations is F. D. Bradbury, and the general dredge master is Walter Clark.

Andagoya is at the confluence of the San Juan and the Condoto. The company's offices, carpenter and machine shops, sawmill, general warehouse, and hospital are located here. There are well-built bungalows for married folks, and screened, airy quarters for the bachelors. All are equipped with running water and electricity.

The machine shop has all the means of handling repair jobs and maintenance work for the dredges, though it is often overloaded with work. Welding plays an important part in keeping the dredges running. Experiments are continually under way to discover which welding wire or method gives best results. Most of the wire is used in building up worn bucket pins, welding lip segments, and filling in lopsided bucket eyes. About 30,000 lb. of welding wire is used yearly, and the quantity is increasing as new applications of welding are found.

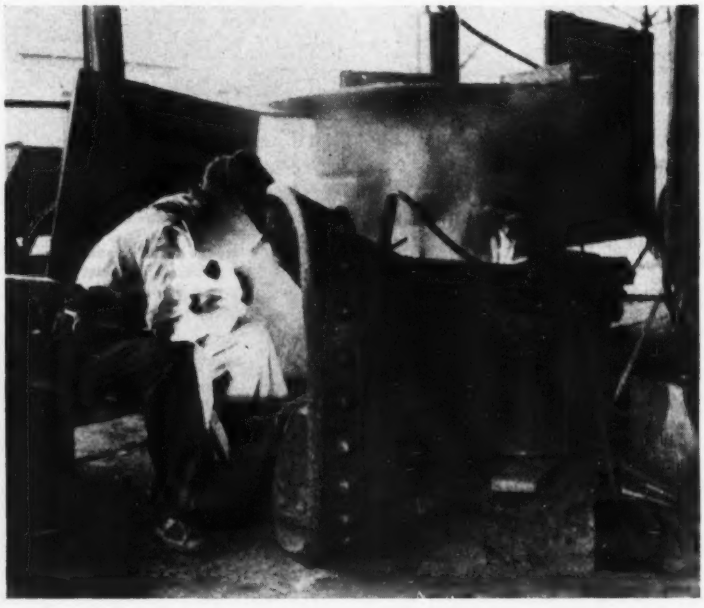
The company has five dredges. All of them are electrically operated. No. 1 is the smallest and the oldest. It was built in Scotland and brought to the Choco by the Anglo Colombian. It was a wood burner, but shortly after the C.M.C.P. took it over it was completely remodeled and electrified. Since that time it has been so often repaired and reinforced that there is hardly any of the original material left. All the others are Bucyrus type dredges and are larger and more up to date. No. 3 is the largest and No. 6 is the most modern. No. 2 dredge sank in 1936, was salvaged in 1939 and is now once more ready for service. Table III shows the location of the dredges and their salient characteristics.

All the dredges except No. 3, which is working in a pond, are headline dredges. High rivers, bringing down trash to choke the screens and cast rooty tree trunks on the bucket line, make winchmen get old sooner, but the real danger is shallow bedrock. In the upper reaches of the river often three feet of bedrock must be dug. It is a constant battle to keep a safe distance between the bucking bottom of the dredge and bedrock. The decomposed shale bedrock is fairly easy digging, but occasionally a hard, black, coarse conglomerate is met.

Dredges digging in the river take alluvial benches in their stride so long as bedrock and values permit. The jungle must be cleared off the ground before it can be dredged. Clearing costs between $16 and $17, American, per acre. Tenor of dredgeable ground varies between 12c. and 18c. per cubic yard. Rarely higher values are encountered, but White's 1- to 2-oz. ground is just a pleasant dream.

The dredges are cleaned up once a

Welders work day and night in the shops at Andagoya



week. Contents of the tables are reconcentrated on one of the longitudinal tables, trapping most of the mercury and amalgam in a conical hydraulic classifier through which all the sands are put. The amalgam is squeezed through cotton cloth and the excess mercury is left on the dredge. The reconcentrated material is then put through a long tom, where coarse gold is caught on an amalgamating plate, and the sands are concentrated enough to go into ten-gallon milk cans. These sands are taken to the laboratory, where they are put in an amalgamating barrel. Several tablespoonfuls of lye and a large cup of mercury are added at this time. The barrel is revolved about ten minutes. The sands are then washed out of the barrel over a copper amalgamating plate, from which they are passed over a vibrating screen. Care is taken to retain in the barrel as much as possible of the mercury and amalgam, which is then collected and combined with other amalgam, carefully cleaned, and then retorted. The sponge gold is melted into brick.

The sand which has passed through the vibrating screen is put over a Wilfley table, where the platinum is removed. After this the metal is further cleaned in a hydraulic classifier and finally by hand panning. Scrap iron is removed with a magnet, but this must be done with care, because some platinum is attracted by the magnet. Now the platinum is dried and weighed. The rejects from the Wilfley table are passed through a Crangle pulsating jig.

Prospective areas are carefully surveyed and mapped. For development prospecting drill lines are laid out 200 to 300 ft. apart and holes are drilled every 100 ft. along the line. The Ward drill is used entirely. It is easy to transport and gives good results under local conditions. For river drilling the rig is mounted on two huge dugout canoes anchored against the current with long iron bars driven into the bottom of the river. From eleven to thirteen men are needed to work the rig under the direction of a white driller. The samples are carefully cleaned and sent to Andagoya. There cleaning is completed under binocular microscope and then the sample is weighed on an assay balance. Gold and platinum are weighed separately. Records kept over years show that dredging recovers about 85 percent of the values indicated by prospecting; however, there is some fluctuation between monthly recovery and prospected values.

At La Vuelta the Andagueda makes a huge loop-like turn and the legs of the loop are separated only by a narrow neck of land. Engineers took advantage of the 16 ft. of difference in elevation and built a hydro-electric power plant where the natives used to drag their canoes over the hogback. They no longer have to do this, for regular canal locks were constructed for their benefit.

Photo by courtesy of M. Brebik

Andagoya. Mess on the left.

The plant's capacity is 2,000 kw. produced by two 1,000-kw. G.E. vertical type turbo-generators. The current is stepped up from 4,400 v. to 33,000 v. for transmission over 37 miles across the divide. Beside the company's needs the plant furnishes power to the towns of Tado, Istmina, and Condoto.

The work of No. 4 dredge is directed from La Vuelta, at which settlement are a small machine shop, a warehouse, and a hospital. Supplies are brought up on the Atrato to Quibdo, and from there to La Vuelta they are transported in the company's launches.

In Andagoya the company has a fleet of launches continually plying between the dredges and Andagoya. River steamers land their cargo in Bebedo, on the San Juan, and large cargo launches bring it up to Andagoya. There is great activity on the river during the rainy season, because only then can heavy cargo be moved on the river without getting grounded on the shallow gravel bars.

There are still large tracts of unexplored land in the Choco, especially in the lower Atrato country and in the vicinity of Mt. Torra. The upper portions of the Atrato and San Juan tributaries may have rich benches of small extension which may be exploited by small-scale mining. To be able to do this the government will have to contruct roads by which supplies can be carried to the workings. So far no one has tried dragline scrapers; it seems to me they could be used with good results where no high-pressure water is available for hydraulicking gravel banks. From the viewpoint of national economy it would be best to develop native mining enterprise, but the present Negro population is not likely to do this; though the natives do well enough under energetic white direction. The obvious thing is to encourage the infiltration of the enterprising and aggressive *antioquenos* who are already skilled in better mining methods. Good roads are the prime necessity of the Choco.

Table I—Ratio of Platinum to Gold in Various Districts of the Choco District

District	Platinum	Gold
Andagueda-Cabi	1	100
Tamana	10	100
Pan de Oro	100	100
Rio Quito above Certegui	50	100
Las Animas Creek	100	100
Opogodo-Condoto	300	100

Table II—Production of Gold and Platinum, 1935-39

Year	Gold, Oz.	Platinum, Oz.
1935	59,880	39,160
1936	66,098	41,024
1937	60,711	29,314
1938	54,521	29,460
1939	64,349	23,671

Table III—Location of Dredges

No. of Dredge	Location	Bucket Size Cu.Ft.	Av. Power Used Kw.	Av. Vol. Dug Per Month, Cu.Yd.
1	Pan de Oro, San Juan river.	5	185	125,000
2	Pachito, San Juan river....	7	200	300,000
3	Mandinga, inland.....	12	431	450,000
4	Andegueda river.....	8	370	350,000
6	San Juan river, below Tado.	8	370	350,000

Bibliography

1. Vicente Restrepo—Estudio sobre las Minas de Oro y Plata de Colombia.
2. Sources: Choco No. 1036, Jan. 22, 1938; *Revista Minera* Vol. XVII No. 100, Oct., 1940; *Revista del Banco de la Republica.*
3. Robert White—Gold and Platinum at Novita Vieja, Colombia. *Engineering and Mining Journal*, Vol. 63, 1897.
4. Henry Granger and Edward Treville—Paper read at convention of A.I.M.E. in Atlantic City, Feb. 1898.
5. Gerardo Botero, A.—*Bosquejo de Paleontologia Colombiana*, p. 46.
6. Roberto Wokittel—Un Perfil par la Vertiente Occidental de la Cordillera Occidental del Choco *Revista Minera* No. 28. Based on the observation of Dr. Karl Ermisch published in *Zeitschr. für Prakt. Geologie* No. 2, 1932.
7. *Revista del Banco de la Republica*, March 1941.
8. Nelson R. Zapata — *Revista Minera*, Nos. 91-92, 1940.

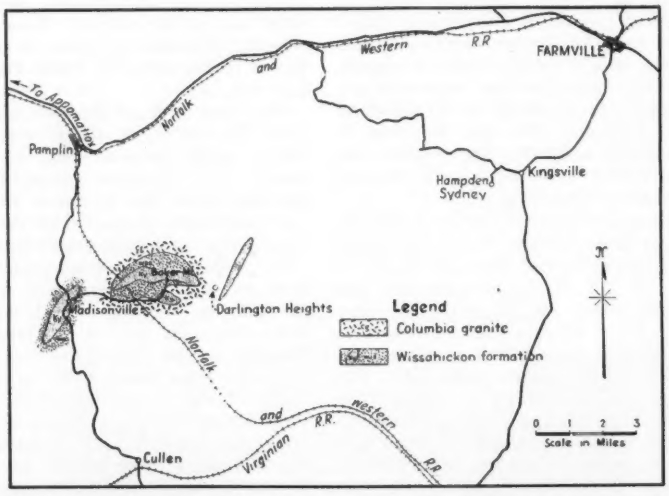
Panorama of the milling and preparation plant of Kyanite Products Corporation, taken from the company's office. 1, Diesel engine plant. 2, Flotation section. 3, Crushing. 4, Dryer and magnetic separator. 5, Dry grinding. 6, Calcining. 7, Bagged storage. 8, Coarse-ore bin

Mining Kyanite on Baker Mountain

This refractory raw material is recovered by flotation by subsidiary of International Agricultural Corporation

A. H. Hubbell
Associate Editor

ONE of the more interesting mineral raw materials utilized in the refractories and ceramic industries is kyanite. Long known in various occurrences, it has nevertheless found its commercial uses only in recent years. In composition it is aluminum silicate, Al_2SiO_5, like sillimanite and andalusite, though differing from them in crystallization and hardness and other physical characteristics. Its ready conversion into mullite upon calcination has given it special value for refractories manufacture. Its bluish bladed crystals are easily recognizable, though the mode of their occurrence may vary widely. For example, in the now well-known deposit that outcrops high on the flank of Celo Mountain[1] in North Carolina, the kyanite is disseminated in relatively small crystals in a hard, compact gneiss, possibly being a replacement of quartz. In southwestern Virginia, near Galax, it is reported found in pegmatite[2], as yet unworked. In central Virginia it occurs importantly on Baker Mountain and elsewhere in quartzite beds inclosed in crystalline schists. Other occurrences, varying in character, might also be cited.[3] It is the Baker Mountain deposit, now under exploitation by Kyanite Products Corporation, and the mining and milling operations of this company, as observed late in May, that provide the subject of this article.



Map of region in which Baker Mountain is situated. Topographic and geologic detail has been taken from a geologic map in Bulletin 38, Virginia Geological Survey

Occurrence of kyanite in large tonnages on Baker Mountain, in south-central Virginia, has long been known. Indeed it could hardly have escaped attention, inasmuch as the "mountain," 2 to 3 miles long and 750 ft. above sea level, or 250 ft. higher than the surrounding territory, consists essentially of kyanite-bearing quartzite beds that are part of the metamorphosed Wissahickon sediments of Pre-Cambrian age and the oldest rocks of this region.[3] Surrounding the island of sediments that forms the mountain, as shown on the accompanying map, is a granodiorite of the Columbia granite series. According to the Survey, the Wissahickon formation comprises gneiss, schist, and micaceous quartzite, the chief constituents being oligoclase, biotite, muscovite, and quartz, plus a varying amount of garnet, staurolite, and kyanite. On Baker Mountain the quartzite contains some pyrite (or in the oxidized zone, iron oxide) and 2 to 3 percent rutile, but no objectionable minerals. Besides being the substance of Baker Mountain, the kyanite-bearing quartzite also forms Willis Mountain, 21 miles northeast, and Woods Mountain, 15 miles away and more nearly north.

[1] V. L. Mattson, *E.&M.J.*, Sept. 1937, p. 45 *et seq.*

[2] Bulletin 38, "Kyanite in Virginia," Virginia Geological Survey.

[3] Bulletin 38, Virginia Geological Survey, p. 5.

Some areas of it also occur near Baker Mountain.

Baker Mountain is in Prince Edward County, about 15 miles in an air line southeast of Appomattox. Twenty years ago, the kyanite property was acquired by J. King McLanahan, Jr., who, with Joel H. Watkins, geologist of Charlotte Court House, Va., organized the McLanahan, Watkins Co. to work it. The tonnage produced was milled in a small plant comprising, first, a grizzly followed by a scrubber, the washed product being ground to minus 8 mesh in a rod mill in closed circuit with a vibrating screen and then classified and tabled. This work continued until the death of Mr. McLanahan in 1926. The plant continued idle until 1937. A new company, the Baker Mountain Corporation, had acquired the property in the intervening period.

The new company, however, never operated, and, after holding the property four years, during which time the holdings were examined by various interests, it gave an option in 1937 to the Phosphate Recovery Corporation. The latter, a subsidiary of International Agricultural Corporation and owner of certain patents, which causes it to take interest in the beneficiation of various non-metallic minerals, operated mine and plant until September, 1940. Then exercising the option, the corporation organized a new company under Virginia laws, calling it the Kyanite Products Corporation.

This company possesses the fees respectively to 275 acres on Baker Mountain and to a tract of similar size on Willis Mountain, where as yet nothing has been done. John T. Burrows, vice president of the I.A.C., is president; William Trotter and R. R. Appleby are vice presidents, and R. P. Resch and J. C. Freeman respectively treasurer and secretary. Directors include Louis Ware, president of the I.A.C., and Messrs. Burrows, Appleby, and Trotter; also George Blow and W. E. D. Stokes, who represent the stockholders of the Baker Mountain Corporation. N. K. Karchmer is manager, in charge of mine and mill. Charles E. Heinrichs, executive assistant to the president, participated in the development and has supervised operations and sales for the past three years. James A. Barr is consulting engineer and H. S. Doty, manager of sales. Thanks are due the company for permitting publication of the facts related. The account of the mining and milling operations is largely as they were described by Mr. Karchmer when I visited the property.

The company's operating office is at the mine and mill, which are adjacent to each other. Tramming distance between the loading points in the open pit and the crushing plant bin is only some 250 ft. Two post offices, Darlington Heights and Madisonville, are within a few miles of the office. Company mail, however, goes to Farmville, 20 miles northeast, where Mr. Karchmer resides. Plant products are shipped from either Pamplin, 7 miles north, on the Norfolk & Western Ry., or Cullen, 7 miles south, on the Virginian Railway.

Since taking the property over the new owners have enlarged the plant and improved the flowsheet, in order to raise the recovery and make more salable products, as well as to increase the number of final products so as to meet consumers' requirements the better. The principal changes, to be dealt with later in discussing the plant, have included the installation of a crushing plant, grinding to 100 percent minus 35 mesh instead of minus 8 mesh, and the addition of equipment for flotation, magnetic separation, calcining, and fine grinding of the finished product to specifications. Thirty-five mesh was the coarsest at which the impurities could be freed. The magnetic plant was needed to get rid of the iron. A 150-hp. diesel plant was also added. This proved too small as operations expanded, and power in recent years has been bought from the Virginia Public Service Co.

Plant capacity is based on that of the flotation section, and the mine is run accordingly. The mine is operated on a schedule adequate to supply a steady feed to the flotation machines. Grade of ore varies with its content of clay, which is washed out prior to flotation. At the time of my visit the quantity of crude ore treated per 24-hr. day was 175 tons, yielding approximately 120 tons for the rod mill and 90 tons to flotation, with an output of 35 tons of concentrate, the ratio of concentration for the entire plant thus being approximately 5 to 1.

These results are attained with 22 men per day in the mine (20 on day shift and 2, tramming, on night shift); 17 men per day on crushing, flotation, drying, and magnetic separation, plus 1 man on the pebble mill and 2 men on bagging for as many shifts as needed, plus 1 man on calcining on each of three 8-hr. shifts for about 8 days in the month. The item of 17 men cited for the mill consists of 2 men on crushing for two 8-hr. shifts, 2 men on flotation for three shifts, 2 on drying for two 8-hr. shifts, and 1 on magnetic separation for three shifts. In addition there are 3 repair men, 2 watchmen, 2 laboratory men, a stenographer, and the manager, giving a total of 50 to 60 men.

Prospecting on the 275 acres owned by the company has been done with diamond drills. In all there are 25 holes, totaling 3,000 ft.

The mine today consists of a semicircular pit with a face about 200 ft. long and walls of 35 ft. maximum height. This has been opened on top of the ridge. The face shows that the deposit, at this point at least, is full of clay seams and parting planes, the ground breaking most irregularly and with poor fragmentation. The quartzite ore is much disintegrated and varies considerably from place to place, consisting now of masses of kyanite crystals, large and small, that almost hide the matrix and at others of compact white quartzite flecked with the kyanite in smaller blades. Between the two extremes there are all gradations. The quartzite, moreover, may yield to schist or be cut by seams filled with soft, foliated, micaceous material, often green with chlorite. These personal observations were made in the course of a visit all too brief. The quartzite

In the open pit of Kyanite Products Corporation. The ground breaks irregularly. The variation in its mineralogical character from point to point makes a visit interesting

John T. Burrows, president of Kyanite Products Corporation

N. K. Karchmer, manager, in charge of mine and mill

C. E. Heinrichs. As executive assistant to the president, he has supervised operations and sales of kyanite

ore and the Wissahickon formation in general are discussed in detail in Bulletin 38 of the Virginia Survey, already cited.

So irregularly does the ground break that maintenance of a well-defined bench for drilling is impossible, according to Mr. Karchmer. Twelve-foot holes are drilled, but the burden and the spacing vary, being 4 ft. at times and 10 ft. at others. With the heavier burden the holes will be sprung and blasted. The holes are mostly down but occasionally toe holes are drilled. Ingersoll-Rand J-55 Jackhamers and Timken removable bits are used. The drilling is dry because the flow of water in the hole that could be had with wet drilling would be too small to remove the large volume of soft material likely to be encountered. Side-hole bits are used, but even these will stick in the clay seams unless the men go slowly. Experience has taught them to hammer the rod for only a second when the bit sticks and then to blow and twist. To assist in cleaning, a $\frac{3}{4}$-in. blowpipe is used, flattened at one end in the manner of a fishtail bit, with a $1\frac{1}{2}$-in. edge and a $\frac{1}{4}$-in. hole in the center. This is churned back and forth in the hole.

At the start, bits were bought in six sizes from $2\frac{1}{8}$ in. down to $1\frac{1}{2}$ in. inclusive. When re-ordering, only the $2\frac{1}{8}$-in. size will be bought, the smaller sizes being obtained on subsequent grinding.

For blasting, DuPont Durox, in 30 percent strength, and DuPont No. 2 blasting powder are used, the latter primarily for sprung holes. The Durox is a low-density, high-velocity, ammonia powder. Blasting is done electrically from a machine with No. 6 DuPont caps and 14-ft. lead wires. Powder consumption varies, being approximately 5 to 7 lb. for an unsprung 12-ft. hole and 18 to 25 lb. for one that is sprung.

The broken ore is shoveled by hand into rocker-dump cars, lumps being sledged to 6 in. size. Pieces of quartz (or "flint") and heavily iron stained ore are sorted out. Waste is piled in the pit. The tram cars have steel bodies and roller bearings. Two of the three have 20-cu.ft. bodies and are of Sanford-Day make. The third has a 27-cu.ft. body and is of Koppel (Pressed Steel Car Co.) make. Tramming is done over 24-in. gage track to the 150-ton wooden coarse-ore bin. The ore is withdrawn from this bin through four hand-operated finger gates, into Sanford-Day, 16-cu.ft. end-dump, 18-in. gage tram cars, and trammed to a 5-ton surge hopper or bin, feeding the crushing plant.

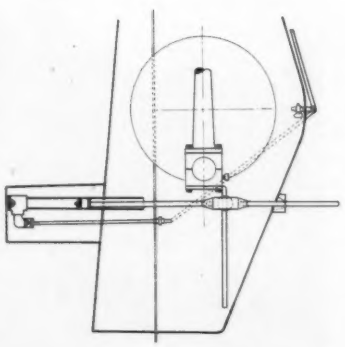
The crushing and milling operations will be described in the October issue.

▼ ▼ ▼

Lubricating Mine Pumps

THE lubrication of automatically controlled three-throw mine drainage pumps caused some trouble at the Great Boulder Mines, Australia, as the pumps operate intermittently during each 24 hours. As some positive means of lubrication was necessary, the attachment shown in the sketch was satisfactorily applied, writes Roger J. Burton.

As springs and other parts liable to failure were to be avoided if possible, the positive gear arrangement was made so as to function properly at all times. A rod was attached to the



cover plate of the pump connecting-rod bearing and by means of a slide block the motion was transmitted to a plunger pump located in an oil sump beneath the pump frame. The tail shaft passing through a guide in the cover was used to keep the pump rod in alignment.

Oil was thus delivered under pressure to petcocks mounted in the cover and located over each crank bearing and crosshead guide. The whole gear was made from stock parts and fittings and has given months of trouble-free operation.

Almost circular in shape and lying between the mill and the factory in the background, is the world's largest open-pit asbestos mine at Asbestos, Quebec, Canada. The blast in the foreground marks the beginning of a new bench known as the 475 level, started this year

Operating the World's Largest ASBESTOS MINE—I

Engineering controls guide daily output of 6,000 tons asbestos rock from the open-pit mine of Canadian Johns-Manville Company, Inc.

H. C. Chellson
Associate Editor

ENDOWED with large resources of gold and base metals that make outstanding contributions to Canada's defense in the present war, the Dominion's non-metallic mining industry emerges, more than ever before, as a source of foreign exchange and an important supplier of products for war purposes. Asbestos heads this list of non-metallic deposits, with mines in the Province of Quebec accounting for virtually all production. The world's largest asbestos mine, the Jeffrey, operated by Canadian Johns-Manville, lies on the edge of a French-Canadian community of 6,000 people called Asbestos, about 115 miles northeast of Montreal.

Mining of "rock cotton," as it was called here, started in 1881, financed by W. H. Jeffrey, a wealthy farmer. In lower New York City about this time H. W. Johns was obtaining small quantities of inferior asbestos fiber from Staten Island and manufacturing a roofing material composed of paper, pitch, burlap, and asbestos. His business was successful, and with research he developed more uses for asbestos. In 1880, Thomas F. Manville, of the Manville Covering Co., making pipe coverings of sheep wool and clay, soon learned its products would not withstand the greater heat required in industry and therefore sought help from H. W. Johns, who utilized asbestos. Thus in 1901 was Johns-Manville formed. The Jeffrey mine was bought by T. F. Manville from the Asbestos & Asbestic Co. in 1916. In 1918 the property was transferred to Canadian Johns-Manville Co., Ltd., which has operated it ever since.

A visit to this property reveals the magnitude of open-pit operations. Approximately 6,000 tons of chrysotile asbestos-bearing rock is mined each day and hauled to the milling plant, where numerous grades of fiber are produced. These fibers are used for manufacturing asbestos products at a company-owned plant in Asbestos. Fibers are also shipped to the United States and other countries of the world, for manufacture into various products.

All asbestos producers in Quebec observe an official Canadian Chrysotile Asbestos Classification, which is strictly followed in the mill and research laboratory of Canadian Johns-Manville. Here careful analyses are made and recorded to meet the wide range of requirements necessary for use in hundreds of asbestos products manufactured by the company.

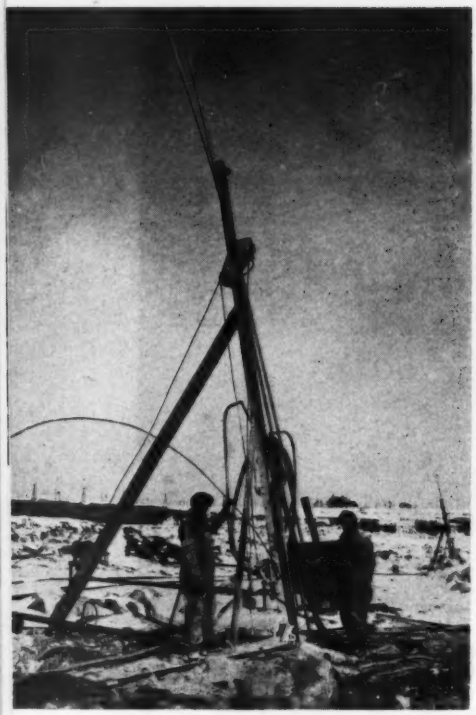
According to the Canadian Classification of May 1, 1940, asbestos mine products are divided into two classes—crude asbestos and milled asbestos, respectively—and defined as follows:

Crude asbestos consists of the hand-selected cross-vein material essentially in its native or unfiberized form.

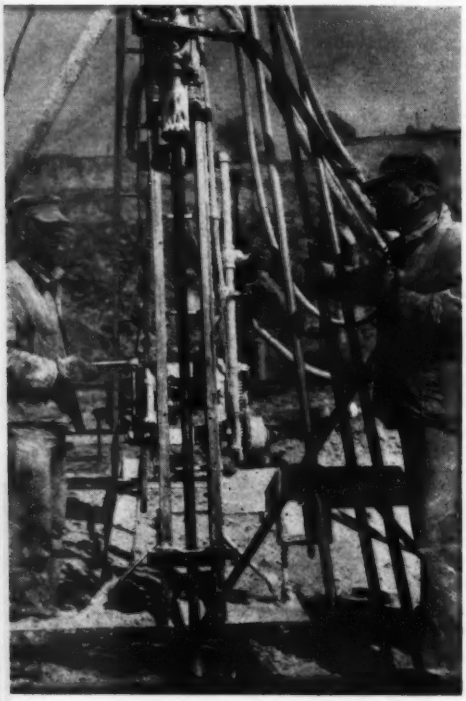
Milled asbestos consists of all grades, produced by mechanical treatment of asbestos ore.

Crude asbestos and *milled asbestos* are subdivided into groups designated and defined as follows: The classification of the Milled Asbestos grades, unless otherwise specified, is based on the Quebec Standard Testing Machine, a description of which is given on pp. 36 and 37 of the report on Mining Operations in the Province of Quebec for 1937. Requirements must also be met for various shipping tests. Table I shows the condensed and major heading of the various grades of crude asbestos.

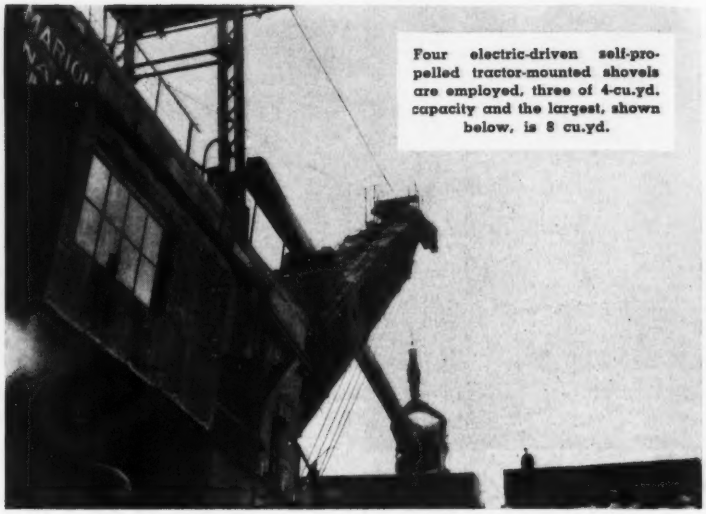
Mine operation must be directed toward mining ore containing fibers in demand. However, mine production cannot be devoted exclusively to rock containing the specific fibers, due to the nature of asbestos ore, and to the necessity of operating on a sound mining basis. The language of the mining engineer producing asbestos involves the terms grades of fiber in the rock, not grade or value of the ore. The daily "assay" is by visual inspection of the ore being



Typical portable drilling rig, which facilitates use of 40-ft. lengths of steel. Cuttings are blown out by small tube held by drill operator



Starting a 40 ft. drill hole with a 4½-in. forged bit to be followed by use of various lengths of steel and detachable bits



Four electric-driven self-propelled tractor-mounted shovels are employed, three of 4-cu.yd. capacity and the largest, shown below, is 8 cu.yd.

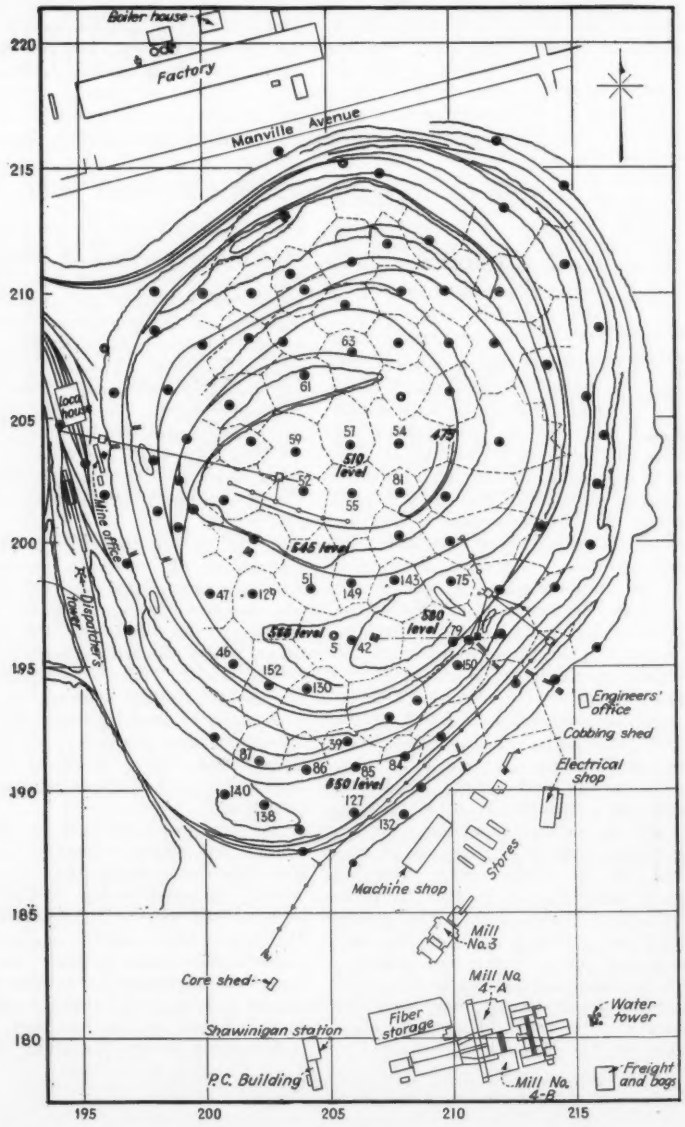


Fig. 1. The mine lies between the large milling plant shown near the bottom and the factory at the top, where asbestos products are made. Drill holes indicated by black circles are near the center of ore blocks outlined by the dash line. The deepest cut, 475 ft. level, near the center of the pit, was started this year

Table I

Subdivisions of Crude Asbestos

Class	Standard Designation of Grade	Definition
Group No. 1..	Crude No. 1.....	Consists basically of crude asbestos three-quarters of an inch staple and longer.
Group No. 2..	Crude No. 2.....	Consists basically of crude asbestos three-eights of an inch staple up to three-quarters of an inch.
	Crude run of mine.....	Consists of unsorted crudes.
	Crudes, sundry.....	Consists of crudes not otherwise specified.

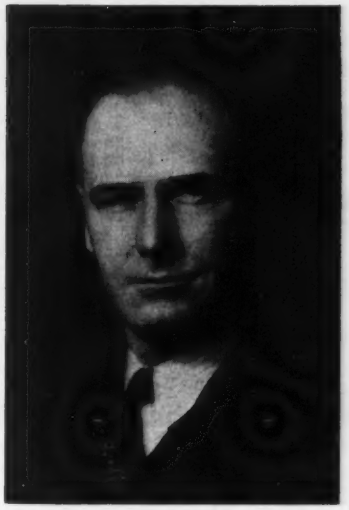
Subdivisions of the Groups of Milled Asbestos

Group No. 3..	Spinning or textile fiber..	Consists of fiber testing *0-8-6-2 and over.
Group No. 4..	Shingle fiber.....	Consists of fiber testing below 0-8-6-2 to and including 0-1½-9½-5.
Group No. 5..	Paper fiber.....	Consists of fiber testing below 0-1½-9½-5 to and including 0-0-8-8.
Group No. 6..	Waste stucco or plaster..	Consists of fiber testing below 0-0-8-8 and above 0-0-5-11.
Group No. 7..	Refuse or shorts.....	Consists of fiber testing 0.0-0.0-5.0-11.0 and below.
Group No. 8..	Sand.....	Consists of such asbestos mill products as sand weighing over 35 lb. and under 75 lb. per cu. ft., loose measure, and containing a preponderance of rock.
Group No. 9..	Gravel and sand.....	Consists of such asbestos mill products weighing 75 lb. and over per cu. ft. loose measure.

Taking as an example the fiber designated as 3D of the spinning or textile fiber group, the 8-6-1-1 means that of a one pound sample of fiber the following ounces are required to remain on the respective meshes to meet the guaranteed minimum shipping test:

Fiber	½ Mesh	¼ Mesh	10 Mesh	Undersize
3-D	8-oz.	6-oz.	1-oz.	1-oz.
3-Z	0-oz.	8-oz.	6-oz.	2-oz.

* There are more than a hundred standard designations of grade in the various fiber groups and each designation must meet its respective minimum requirement for shipping.



H. K. Sherry, vice president and manager of operations at Asbestos, Quebec, Canada

mined, this grading being done by the highly skilled mine supervisory staff.

Close engineering controls based on diamond-drill-hole data, records of mined-out areas, daily records of visual examination of ore in the mine as well as the mill, plus the exacting daily mill report, all contribute toward maintaining mine operations in a direction desired. As it takes several hours for a cycle of ore to be mined, hauled to the mill, and processed, these daily control data are readily available for reference and checking. Mining areas in the pit have been or are being diamond drilled, each hole being numbered. Blocks of ore (Fig. 1) are also numbered and fiber contents determined from drill logs. These records serve as controls for mining involving a 35-ft. digging bench.

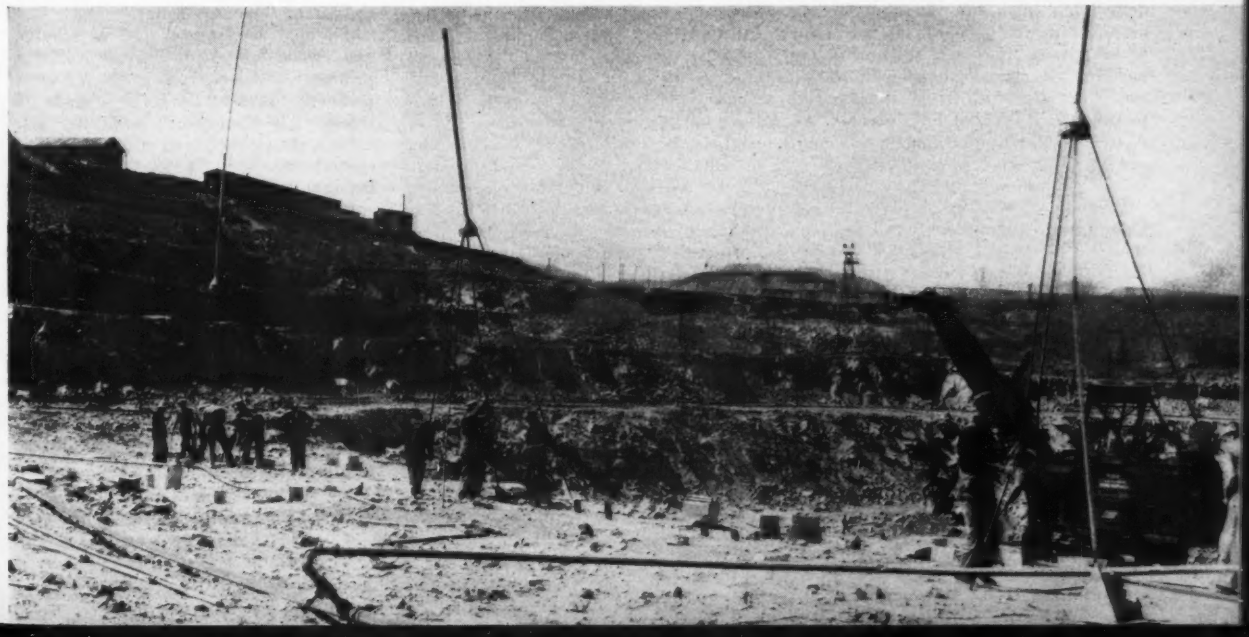
Every loaded car is observed by the mine foreman and note is made on his report of the block of ore where it was mined. Visual classification by the mine operating department is further checked by the mill production man, who phones hourly to the train dispatcher. The status of the past hour's production is immediately made available to the mine foreman by the dispatcher. In this manner, hourly control of ore classification and production is maintained.

Refinements and greater care in the records of this practice have been introduced within the past two years for purposes of obtaining accurate and correlated data for directing future underground mining operations; also, for a more accurate basis for determining location of various grades of fibers and the amounts recoverable, and to permit more exact data for intelligent guidance in meeting the growing sales requirements of the asbestos industry. These engineering controls, as they are called, are only possible within reasonable daily limits because asbestos deposits are quite inconsistent. Sometimes areas interpolated by drilling, as virtually waste rock, will show high-grade fiber upon blasting. Due to these spotty formations, the shovels must be so placed as to equalize or balance hourly production and to obtain an even feed to the mill of the required grades of fibers. Each year an amazing accuracy is found between estimated fiber production and quantity and quality actually produced.

The mining department, headed by Charles D. Borror, mine superintendent, and Harry Marek, assistant, directs the stripping of overburden, primary and secondary rock drilling, diamond drilling, blasting, and excavation.

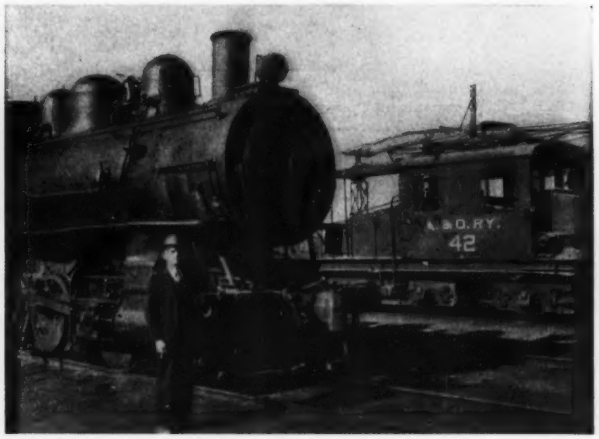
The unique vertical drilling practice employing 40-ft. steel lengths, introduced in 1920 by H. K. Sherry, now vice president in charge of operations at Asbestos, is used in drilling bench

Tamping practice involves the use of a 42-ft. rubber tipped tamping pole guided by an especially designed light weight tripod



Charles Borror, mine superintendent

Harry Marek, assistant mine superintendent



L. H. Gale, superintendent of transportation

blast holes. This method was condemned by many in the industry at the time of its inception, but it has not only proved the test of time but is considered a forerunner of portable vertical drill rigs in common use today.

Seven steel-tripod drilling rigs are used with two men on a rig. Operations are on a three-shift basis, six days per week. Two especially built Canadian drills having rifle-bar rotation and eight independent rotated type machines are employed. Drills are mounted on a large tripod designed to support a 40-ft. length of hollow drill steel and holes are sunk at an approximate 11 deg. angle from the top of the bench. In starting a hole, a 6-ft. length of steel with a forged bit 4½ in. in diameter is used to drill a hole 12 to 18 in. deep, in which is set a short casing 3½ in. in diameter. A 12-ft. steel is then used with a 3¼-in. detachable bit, followed by a change to 20- to 24-ft. steel and a 3⅛-in. bit. Then a 28- to 32-ft. steel and a 3-in. detachable bit, finishing with a 38- to 42-ft. length of hollow 1½-in. drill steel with a 2⅞-in. gage detachable bit. The average footage obtained in 1940 was 25 ft. per hour or about five holes per shift. On the basis of bits run or sharpened, 100 ft. was averaged with four sharpenings per bit, or 500 ft. of hole per bit. An auxiliary blower pipe made of cold-drawn ¼-in. steel tubing is used to keep the hole free of cuttings.

Primary blasting in the 40-ft. bench holes require about 30 lb. of 40 percent special 2x16-in. sticks of powder. Each day between 400 and 600 secondary holes are loaded with 25 percent powder 1x8 in. low-freezing nitroglycerine dynamite. All blasting is electric, with four shooting control points available for connection to electric current in the pit. Tamping practice involves use of a 42-ft. rubber tipped tamping pole guided by an especially designed tripod. A secondary blasting crew consists of three men, called tamper, connector, and blaster, respectively. Secondary holes are tamped with paper cartridges filled with asbestos mill fines.

H. S. Deeley, cost reduction manager

Four electric-driven shovels are employed digging at the foot of benches 35 ft. high. Three are of 4-cu.yd. capacity and one is of 8 cu.yd., and all are self-propelled tractor-mounted. Two gasoline engine powered shovels of 1¼-cu.yd. capacity are used for cleaning up, following stripping and to move rock where long fibers are available, for hand cobbing. These shovels have the necessary auxiliary equipment to make them convertible to back diggers. Detachable bucket teeth are generally used on shovel buckets, but solid teeth are employed on the 8-cu.yd. shovel. Some experimental work is being done on smaller shovels using solid teeth and building up worn parts by welding.

Power is brought to the mine from the power center on overhead lines, and is distributed to the various levels on portable steel towers, 22 ft. in height. From these towers, power is taken to the shovels by means of 750-ft. lengths of rubber-covered cables.

Overburden and waste rock are loaded into side-dump cars of 30-cu.yd. capacity. Smaller side-dump cars are used for ore haulage. Ten steam locomotives, two 60-ton electric locomotives, and one 85-ton steel-car locomotive comprise the motive equipment hauling ore, waste, and tailings over 28 miles of track, of which seven are equipped for trolley electric haulage. Steam locomotives are used in the pit for hauling to the gathering level, where electric haulage transports ore cars to the mill, and to the tailings and waste dumps. Eighty-five pound rails are used and on all ore levels steel railroad ties are employed.

The railroad division of the company, known as the Asbestos & Danville Railroad Co., is under the supervision of L. H. Gale. This division provides equipment and track maintenance. Fourteen steam locomotives are employed—ten, as mentioned in the foregoing, being used for mine work and the remainder for freight and miscellaneous service. Three men comprise a crew for steam haulage from the mine. Two men comprise a crew for electric haulage. Track moving is done in the pit by a bulldozer and a track shifter. Maintenance of equipment in the mine and the Asbestos & Danville Railway is in charge of Thomas Miller.

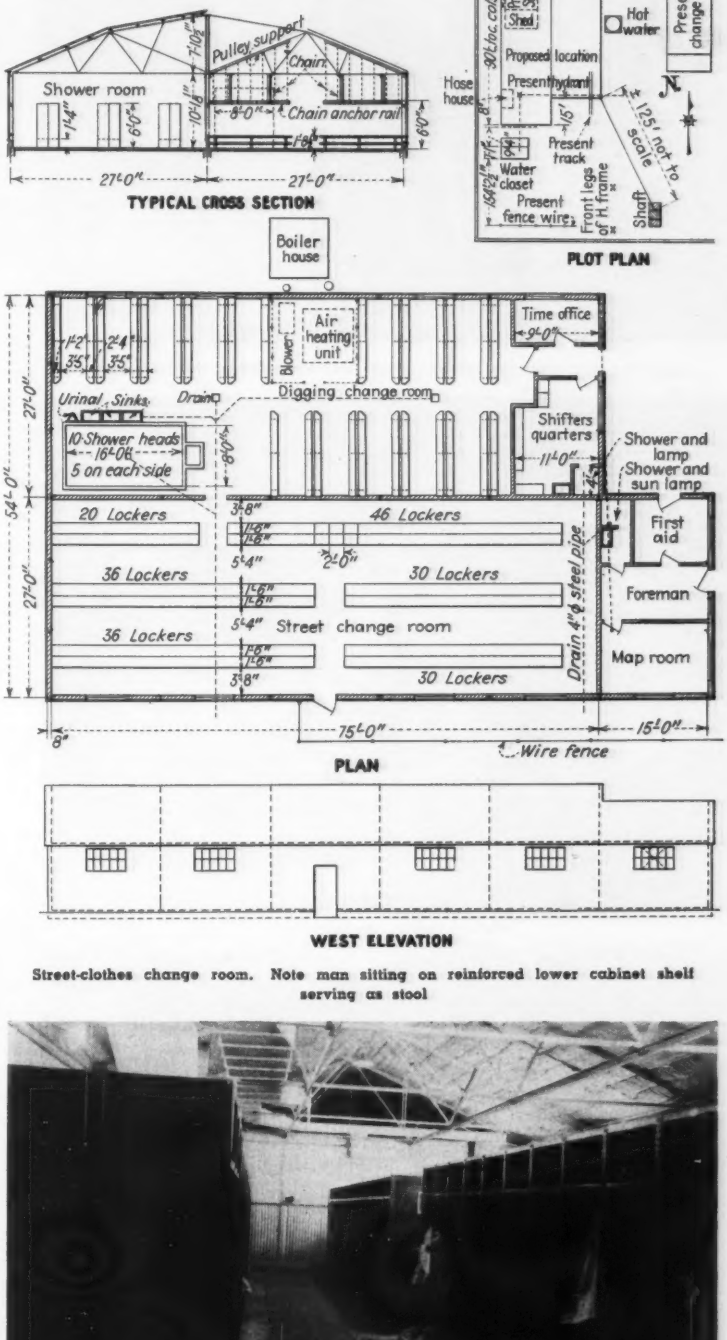
As zinc is "poison" to a smelter man, wood is "poison" to the asbestos producer. No equipment in the ore-producing area of the mine is made of wood. All equipment, such as ties, cabins, stairs, etc., is of metal. Wooden core boxes for diamond drill cores brought in and out of the mine are placed in metal cases. Matches and other foreign material are prohibited to be carried into the mine. Rigid clean-up is a law of the mine and every man must assist in good housekeeping, which is unusually well maintained. Wooden splinters or other foreign material in fiber can do injury to the equipment used in manufacturing asbestos products or to the products themselves.

Part II of this article will appear in the October issue.

A Model Change House

John B. Huttl
Assistant Editor

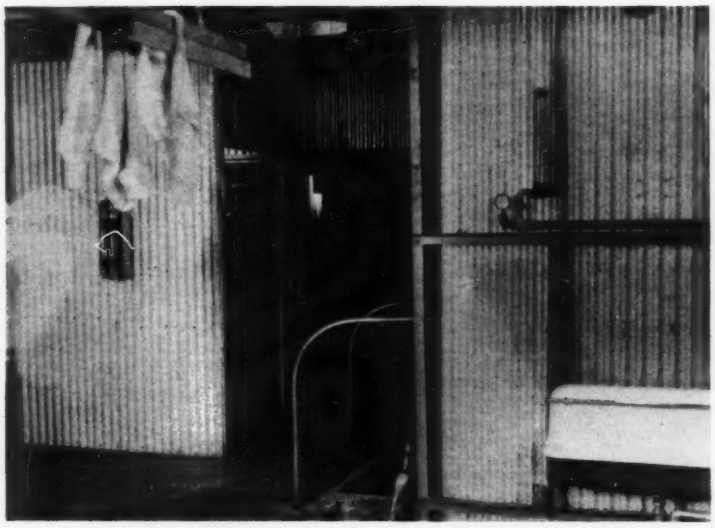
Details of change house at Old Eureka shaft, Central Eureka Mining Co., Sutter Creek, Calif.



Street-clothes change room. Note man sitting on reinforced lower cabinet shelf serving as stool

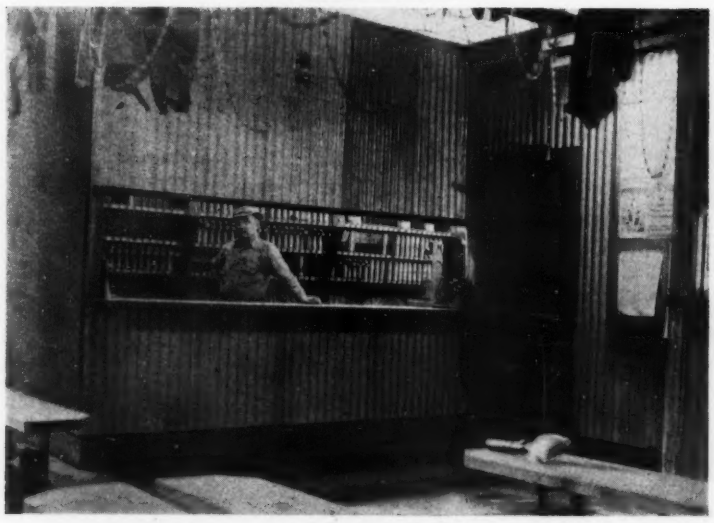
A SURFACE PLANT UNIT that has aroused considerable interest among mine operators and engineers on the Mother Lode is the new change house completed recently by the Central Eureka Mining Co. at its property at Sutter Creek, Amador County, Calif. It is one of the main structures included in the comprehensive modernization program started by the company more than a year ago, and incorporated in its design are features and equipment to safeguard the health of the miners and provide maximum safety and comfort. For instance, the temperature of the various rooms is controlled automatically, use of specially designed clothes storage fixtures provides for clean and clear floors at all times, with consequent reduction to a minimum of possible accidents caused by falls, and separate rooms for storing street clothes and working clothes offer greater comfort and safety as regards to health to the men. Also, the men have to pass nude from one chamber to the other before getting into their street or working clothes, and thus a thorough check can be made from a small inspection booth between the two chambers. The booth is also used for storing valuables and money. The complete structure provides accommodations for 200 men.

The building proper is an all-steel, fireproof structure covered with corrugated iron sheets, with the walls and roof insulated with 2-in. Thermax and 4-in. wool blanket respectively, and painted with fire-resisting cement paint. As will be seen in the accompanying line drawing, the interior is divided into two main change rooms, independent rooms for the mine superintendent and shift bosses, drafting and map room, first-aid booth, electric lamp and check room, shower room, and an inspection and storage booth. Equipment in the dry room (street clothes) consists of several rows of steel cabinets, each numbered and fitted with a reinforced lower shelf installed at a point so as to serve as a seat for the men—a feature which obviates the need of individual stools or benches. The aisles between the cabinets are covered with rubber matting. In the working clothes change room there are a number of steel benches with wooden tops and wire-screen shelves or baskets extending the entire length of the bench a short distance below the tops for boots and other objects, which help to keep the floor clear, and numbered four-point



Inspection booth between working-clothes and street-clothes change rooms

Working-clothes change room



Lamp and check room

steel hooks with ball tips for the working clothes. These hooks can be lowered and raised by a simple chain-and-pulley arrangement.

The shower room is a part of the working clothes change room. It contains ten showers controlled by individual regulating valves, and containers for powdered soap. The all-porcelain wash bowls and urinals are installed on the outer wall of the shower room, as indicated in the line drawing. A small, shallow concrete footbath at the door if the shower room, filled with hyposulphite and water, protects the men against possible infection of athlete's foot. Hot water is obtained from a special water heater shown above the shower room. This is a boiler-like tank in which operate a series of copper coils heated by low-pressure steam. Water pressure is maintained at 20 lb. to insure proper and safe operation of the shower sprays. The exterior of the tank and all pipes leading to it are heavily insulated to prevent heat losses. Water condensed in the copper coils returns by gravity to the main boiler plant. Low-pressure steam is also used for heating the interior of the building. A special converter with a Sturtevant Silent-Vane fan driven by a 1½-hp. motor is available for this work. In the converter the air is heated by a network of built-in copper steam pipes, and subsequently distributed to the different rooms by a well-arranged duct layout. Ventilating units are installed in the two end-walls of the building. Dry room (street clothes) temperature is maintained at 80 deg. F., and that of the working clothes change room also at 80 deg. F., but with a ceiling temperature of 130 deg. F. to expedite drying of wet mine clothes suspended from the steel hooks mentioned previously. All temperatures are adjusted automatically by rheostat, and as the rooms can be separated, appropriate temperature changes can be made in each. Ample light is provided during the day and night periods by large windows and electric lights.

The steam-generating plant is only a short distance from the change house proper, and houses an oil-fired Kewanee boiler producing steam at 10-lb. pressure. Operation is entirely automatic. Fuel oil for the burner is obtained from an underground storage tank, and water from the general supply reservoir. The boiler also re-uses the water condensed in the steam coils in the water heater above the shower room. The installation described in the preceding was designed by the company's engineering department, together with J. T. Walsh, as consulting erecting engineer, and Messrs. Hunter and Hudson, of San Francisco, as consulting heating and ventilation engineers, all under the direction of James Spiers, general superintendent.

Carlton Tunnel Invites Deep Mining For Cripple Creek

Modern equipment operated by miners on a bonus system sets new world's record in tunnel driving to dewater mines in Colorado's leading gold camp

H. C. Chellson
Associate Editor

***Sketches by artist Irwin D. Hoffman** **

FINDING GOLD and then fighting water became consistent cycles of mining history in Cripple Creek, Colo., soon after gold was discovered there in 1887. In those early days shallow mining disclosed the existence of a water problem among the gold telluride veins found within the Cripple Creek volcanic plug. Geologists have classified the igneous body as being composed chiefly of phonolitic breccia surrounded by walls of Pikes Peak granite. This structure was "suggestive of a water-soaked sponge set in a glass cup," as the late Waldemar Lindgren described it.

Water in this irregular volcanic mass has been lowered by development tunnels serving to cut veins in depth as well as by tunnels specifically driven to lower the water level so as to eliminate high pumping costs. Among the latter group was the Standard tunnel, which first lowered the water level, from about 9,600 ft. above sea level to 9,027 ft., followed by the El Paso tunnel, driven in 1902, permitting mining to 8,783 ft. Then on May 11, 1907, "amid cheers of thousands and blowing of whistles and ringing of bells," the famous Roosevelt tunnel was started at elevation 8,020 ft. above sea level. This 26,000-ft. project was completed in 1918 under the direction of A. E. Carlton, after overcoming many difficulties by improving the technique of tunnel driving. Mining proceeded to lower levels from 1918 to 1930, when once more high pumping costs slowly drowned out production from mines that eventually reached below the Roosevelt tunnel.

Encouraged by the presence of good ore below the Roosevelt tunnel, but with efficient exploitation prohibited by high pumping costs, Alfred H. Bebee, vice president in charge of mining operations of the Golden Cycle Corp., recommended the driving of a new tunnel. Work started on July 18, 1939. The Golden Cycle Corp., operating many mines, and with its large mill in Colorado Springs dependent on Cripple Creek ores, appropriated $1,000,000 for the project. In memory of the foresight, courage, and many contributions made to the Cripple Creek district by A. E. Carlton and his brother Leslie, the project was christened the Carlton tunnel on Sept. 4, 1939, by Mrs. A. E. Carlton.

Completion of the 9x8-ft. Carlton tunnel 1,100 ft. below the Roosevelt, on July 23, 1941, encourages mine owners and leasers in the Cripple Creek district to look forward to the cycle of deepest development and mining in the history of the camp. Confidence in such an undertaking has been increased by the finding of four veins in the tunnel, only one of which is known, two are surmised, and one is unknown. Value of Cripple Creek metal output has been currently running around $5,000,000 per year.

Available records disclose the interesting fact that the heaviest volume of water encountered in the Standard, El Paso, Roosevelt, and Carlton tunnels has been between 18,000 and 25,000 g.p.m., which gradually receded. Drainage in the Roosevelt tunnel today, however, is considered merely seasonal run-off. When the Roosevelt tunnel was being driven, engineers computed that it would cost six and one-half times more to drain the district by pumping to the tunnel horizon, than to drive the tunnel.

Four years was estimated to be the time required for completion of the Carlton tunnel, but it was not long until Cripple Creek gained laurels as a locale where new world records in tunnel driving were being achieved. Un-

A. H. Bebee, vice president Golden Cycle Corp., proposed a new tunnel

"Long John," Austin tunnel superintendent, encouraged his men

Robert Welsh, master mechanic, kept miners supplied with good tools

** Mr. Hoffman, well known for his painting of life and achievements in the mining industry, was at the Carlton tunnel during the visit of the author and made charcoal sketches underground and on the surface of men connected with the project. He has kindly permitted use of five sketches to be reproduced with this article, for which *E.&M.J.* extends thanks.*

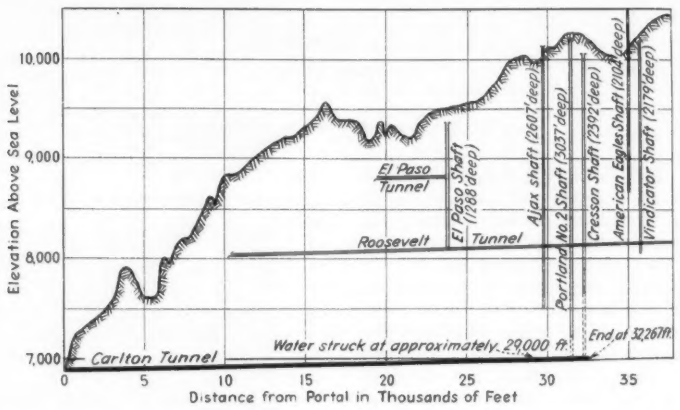
Hard-rock miners of Cripple Creek unleashed water for deeper mining

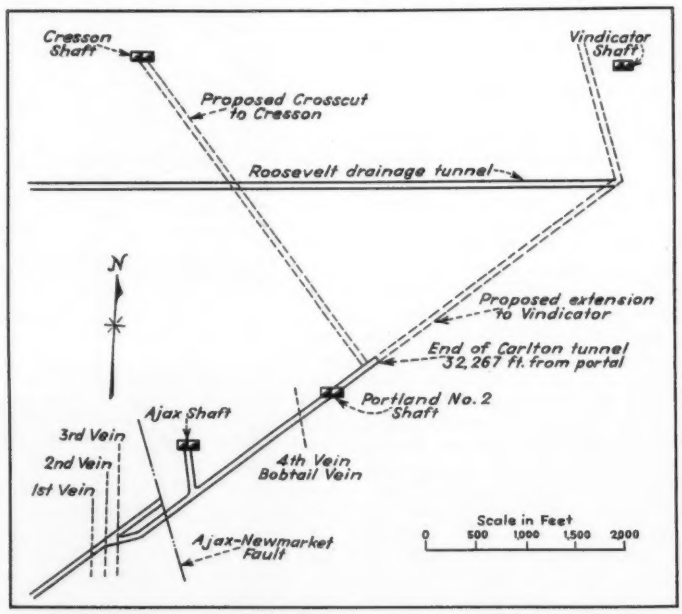
der the direction of John Austin, tunnel superintendent, better known as "Long John," (6 ft. 7 in. tall) 32,262 ft. of Pikes Peak granite was tunnelled in 683 working days. The accompanying table shows the progress achieved and other interesting operating data for each mile of advance. Of the total footage, 31,600 ft. was driven on a straight line from one entry, a new world's record; 239 ft. was required to bypass the Ajax-Newmarket fault, and 428 ft. was driven in a crosscut to a point directly beneath the Ajax mine.

These noteworthy achievements provide the mining industry with important technical data, chief of which is the demonstrated capacity of present-day mining equipment to improve efficiency. The Carlton tunnel was driven with conventional steel for the first thousand feet, followed by 12 000 ft. employing Timken H removable bits, and the remainder with a specially designed Ingersoll-Rand Sibley Jackbit. Hot-milling was employed in bit sharpening, obtaining seven uses for each bit at a cost of 3.5c. (average) per milling. As drilling advanced operations were closely studied and the $2\frac{1}{8}$ in. starter was reduced to $1\frac{3}{4}$ in., which, according to Superintendent Austin, saved 26 percent in drilling time. Five DA-35 $3\frac{1}{2}$-in. automatic-feed type Ingersoll-Rand drifters were used, mounted on an uniquely designed "collapsible" 5-ton jumbo 20 ft. long. There were two mountings on the rear of the jumbo available for miscellaneous trimming of the roof and sides. Following adaption of the $1\frac{3}{4}$-in. starter it was observed that greater bit service could be obtained by adding two more starter sizes, $1\frac{1}{16}$ and $1\frac{3}{8}$ in., respectively. Practice was to follow the new $1\frac{3}{4}$-in. starter by $1\frac{1}{16}$-in. and then by $1\frac{9}{16}$-in. bit gage, finishing the hole with $1\frac{7}{16}$-in. size. The $1\frac{1}{16}$- and $1\frac{3}{8}$-in. starter bits were followed by $1\frac{9}{16}$-in., $1\frac{1}{2}$, and $1\frac{7}{16}$-in. bits, respectively. Near the fault zone, however, holes were finished with large-sized bits to allow insertion of metal cylinders described later.

An average of 1,100 bits were dulled daily. Master Mechanic Robert Welsh determined that by hot-milling only one sized bit each day, time was saved by the two men employed doing the work. As high as 1,512 bits have been milled by 3 to 4 men on an 8-hr. shift, but the average for 7 hours' work is 1,200 bits per day. Adding

Vertical projection shows Carlton tunnel and some deep Cripple Creek mines





Engineering accuracy directed the line of tunnel advance that reached points suitable for connection to the Portland and Ajax mines

Operating Data on Driving Carlton Tunnel, Started July 18, 1939, and Completed July 22, 1941

	Timbering		Drilling		Mucking		Excavated (Cu.Yd.)	Cars Loaded (3 Cy. Yd. Each)	Powder, Lb.	Powder, Lb. per Ft.	Caps	Caps (Per Ft.)	Rounds	Feet (Per Round)	Working Days	Average Footage per Day
	Hr.	Min.	Hr.	Min.	Hr.	Min.										
1st mile	160	30	1,463	15	1,280	15	20,437	11,165	128,667	24.4	26,395	4.98	889.71	5.93	121	43.60
2d mile	None		1,488	45	1,103	15	19,661	9,341	189,079	35.8	26,356	4.99	823.35	6.33	108	48.90
3d mile	None		1,236	35	1,067	25	20,069	9,397	183,189	34.7	25,243	4.78	659.71	8.00	96	55.00
4th mile	None		1,113	15	1,142	35	20,290	9,594	171,695	32.5	26,248	4.97	642.21	8.22	94	56.20
5th mile	None		1,232	15	1,023	35	19,569	9,091	181,104	34.3	26,030	4.93	624.68	8.45	94	56.20
6th mile	231	35	1,749	35	1,690	50	20,129	9,745	198,146	37.5	36,516	6.90	785.34	6.73	153	34.51
587 ft. to end	None		226	50	190	10	2,320	1,101	23,300	39.69	5,087	8.67	93.00	6.31	17	34.53
Total 32,267 ft.	392	05	8,510	30	7,498	05	122,475	59,434	1,075,180	33.32	171,875	5.33	4,518.00	7.14	683	47.24

the two new starting bit sizes and hot-milling only a specified sized bit each day were said to permit another 6 percent increase in drilling speed, or a total of 32 percent gained as work progressed. This is indicated by the average daily advance, starting at 43.6 ft. in the first mile, 48.9 in the second, 55 for the third, and 56.2 in the fourth and fifth miles. Subsequent advance was retarded by heavy water flow.

Each round required from 37 to 42 holes averaging 7.14 ft. deep. Two and three rounds were drilled each shift, using 1¼-in. hollow round drill-rod lengths of 3, 5, 7, and 9 ft., respectively. Superintendent Austin encouraged his drilling crews to suggest improvements, and as the men received a bonus on a footage basis over 10 ft. per shift, calculated each month, there developed a cooperative spirit of rugged individualism, which carried this project to its meritorious completion. Achievements which the drilling crews claim as world's records are driving 1,879 ft. in 31 consecutive days; 647 ft. advance by one crew for 31 consecutive days; 27 ft. advance in 8 hr., and 78 ft. advance in 24 hr.

As the tunnel approached the area where a heavy water flow was expected, sticks of 60 percent Du Pont Gelex were placed in cylinders 1½ in. inside diameter made of 30-gage galvanized sheet iron, each cylinder 10 ft. long. These were slipped into drill holes with wired connection for electric blasting using No. 6X delay caps. Each cylinder was securely capped with a rubber plug and the round was set off from a point about 1,500 ft. from the blast, using a storage battery for current supply. Ventilation was maintained by two large Root-Connersville blowers near the portal, exhausting 10,000 cu.ft. of air through an 18-in. diameter tar-wrapped steel ventilating pipe.

Mechanical loading demonstrated its low operating cost and permitted other efficient contributions to modern mining methods in this project. An air-operated Eimco Findlay No. 21 mechanical loader was employed, dumping directly into 3-cu.yd. Granby-type cars, loading at the rate of between 53 and 56 tons of granite per hour. A vertical lifting portable air-operated "cherry-picker" facilitated placing of cars for loading. One Goodman and three General Electric storage-battery locomotives were in service, operating on 52-lb. rails on a three-tenths of 1 percent grade. Each locomotive was run by a 56-cell 110 to 112-volt Exide storage-battery unit. Compressed air at the portal was kept at 135-lb. pressure and 125-lb. at the drills, through a 6-in. all-welded pipeline.

On Feb. 20, 1941, broken ground near the Ajax-Newmarket fault was reached. Water was struck a short distance beyond the fault, with the flow beginning the size of a lead pencil, with high pressure gradually building up to around 800 g.p.m. Late in the afternoon, water came with such force through the floor as to tear loose large pieces of rock. The tunnel was abandoned and the maximum flow of water reached was estimated between 20,000 and 25,000 g.p.m., which receded in two weeks to between 8,000 and 9,000 g.p.m. Work resumed in March, following raising of the track and elevating the storage battery and motors of the electric locomotives so they could operate through the high water.

Outstanding among events following this heavy water flow was the rapid drop of the water in the Ajax mine, where pumping ceased when the tunnel was started in 1939. The water dropped from 8,057 ft. above sea level on Feb. 20 to 7,545 ft. by March 1, or a drop of approximately 512 ft. in ten days. The Ajax-Newmarket fault passes through this mine and therefore is believed to have facilitated this rapid drainage. Upon inspection all wiring, pipes, track, and ties in the mine were in good order and little rehabilitation was necessary. Electric lights that had been under water for two years burned as usual when the current was connected. Mine development on the Ajax is now advancing on the 23d, 24th, and 26th levels on company account, with leasers exploiting the upper levels. Charles Carlton is superintendent.

The first unknown vein found in the tunnel was 28,215 ft. from the portal, and assayed from $12.25 to $114.80 in gold per ton. Two other veins at 28,360 ft. and 28,530 ft. respectively, with unknown possibilities, were also cut. The Bobtail was the last vein cut in the tunnel. The second and third veins are suspected to be related to the Ajax-Newmarket fault. At present about 30 men are prospecting and developing these veins in the tunnel. Water is receding in the Portland No. 2 about 2 ft. per day.

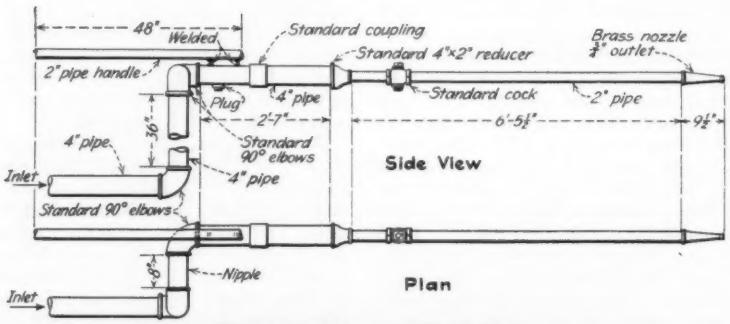
About 700 ft. of water has been standing in the Portland since 1929, and it is expected that nine months will be required to complete shaft sinking and general rehabilitation of this mine. Natural tunnel ventilation will be provided as soon as a winze in the Portland mine is connected by a 110-ft. raise from the tunnel level. When this is achieved, the Portland shaft will be connected with the tunnel. This will require sinking a vertical distance of 250 ft., projecting the Portland shaft to 3,258 ft., the deepest in the district. Mel Salsbury is superintendent of the Portland mine.

Following completion of this objective two laterals are planned, one, about 4,000 ft. long, to the Cresson mine, Cripple Creek's largest producer, and the other, 5,000 ft. long, to the Vindicator mine. John Stark and J. S. Anderson are superintendents of these mines, respectively. In the future deep development of the Ajax, Cresson, Vindicator, Portland, and many other mines in the district, operators and leasers may avail themselves of the use of the latest mining equipment used in the tunnel; encourage financing and developing of mining property; add to Colorado's mineral wealth and employment; and offer greater study to geologists. Cripple Creek's present generation is, however, aware that a successful and profitable future of the district depends on taxes, government restrictions, metal prices, and the hope that general world economic conditions will permit prosperity to be realized. If so, perhaps the next generation may decide another deep drainage tunnel may be necessary. The approximate site, incidentally, can be pointed out in a deep ravine on the highway from the Carlton tunnel to Canyon City.

Drill crews broke through Pikes Peak granite, making new records

Monitor Used To Excavate Mill Extension Site

E. J. Kneebone
Atok Gold Mining Company
Baguio, P. I.



Monitor in action

Preliminary work on thickener floor

Thickener floor nearly completed

THE BIG WEDGE MINE of the Atok Gold Mining Co. recently undertook a program of mill expansion to increase its capacity from 200 to 400 tons per day and used the following method of excavating for the extension:

The four present mill floors, Ball Mill, Thickener, Agitator, and the Filter Floor, were to be extended 60 ft., 110 ft., 90 ft., and 90 ft., respectively, to accommodate the new equipment required for the additional tonnage capacity.

There being no practical site on which to dispose of the cut material by hand methods, and no mechanical excavating equipment available, the company was faced with the necessity of devising an economical scheme to accomplish its purpose. With approximately 12,000 cu.yd. of decomposed diorite to be excavated and the overburden carried away, it was decided that water under high pressure could cut this material and by washing the spoil down an adjacent ravine to a nearby stream, thus effectively dispose of it.

Accordingly, Walter Neal, acting general superintendent, devised and manufactured in the company shop the monitor employed, a sketch of which is shown. A 50-hp. pump was used to supply the necessary water from the stream to the monitor.

The excavation of the four floors was started in October, 1940, and carried on intermittently until it was completed in February of this year. Segregated operating costs without capital charges were: Labor (monitor operators, 1,007 hr.) $68.93; pickers, cleaners, and trimmers, $112.50; one 50-hp. pump, $376.24; total over-all cost, $557.67, or $0.0465 per cubic yard. The pump was salvaged and the monitor and the pipe leading to it were made up of used and scrap materials.

Photoelectric Comparator for Colorimetric Copper Assay

John C. Russell
Metallurgical Engineer
Chichagof, Alaska

DURING the recent operation of the experimental plant of the Phelps Dodge Corporation, Morenci Branch, a number of competitive flotation machines were under simultaneous test. It was found desirable to supplement the regular shift samples and assays with a quick and accurate method by which the flotation operators could determine copper in the circuit heads and machine tailings at regular intervals during the shifts.

Inasmuch as time was as important as accuracy, colorimetric assay was indicated. Laboratory facilities were set up, and with some slight modifications the standard colorimetric copper assay routine was followed. With practice, a cycle of fifty minutes was established for the usual group of one head sample and five machine tail samples from the time the operator brought the wet pulp to the laboratory until the results were posted. Visual comparison was made with predetermined standard solutions in a comparimeter.

From the outset difficulty was experienced in obtaining check readings on the comparimeter between two observers on the same samples. The observers were not experienced in colorimeter work, and the results obtained, though fairly satisfactory for their purpose, were not accurate within the limits of the chemical method. Because discrepancies in the results were definitely traced to this cause, it was felt that accuracy could be greatly increased by elimination of the human error involved in visual comparison, and the use of some adaptation of the photoelectric cell.

After some experimentation a satisfactory apparatus was devised and constructed. As anticipated, the substitution of the photoelectric comparator for the visual colorimeter gave a marked increase in the accuracy of the method, and satisfactory checks with the wet electrolytic copper assays were obtained.

The comparator as developed consists of an oblong box divided into two sections as indicated in the cut. On one side of the dividing partition is mounted a light source consisting of three flashlight batteries connected in series, a variable resistance, a snap switch, and a flashlight reflector and bulb. The reflector and bulb are focused on the partition. Total voltage on the circuit is approximately 11 volts.

The partition consists of a block of wood with a portion approximately 1½ in. by 3 in. cut out of the top half in the center, and faced with parallel strips of metal as detailed in the drawing. In the sheet on the side adjacent to the light source and in the center of the space is a circular aperture on which the light is focused. In the sheet on the side away from the light source is a similar circular aperture in the same relative position and of the same size—¼ in.

On the opposite side of the partition from the light source is a Westinghouse Photox cell, so mounted that light passing through the apertures is focused on the circular sensitized face. The Photox cell is in circuit with a microammeter mounted on the outside of the box.

The comparator is closed by a tightly fitting cover which has a rectangular hole in line with the space in the partition, allowing a solution bottle to be inserted in the partition without the necessity of removing the cover. The snap switch and the variable resistance control of the light circuit, as well as the microammeter, are mounted on the outside of the box.

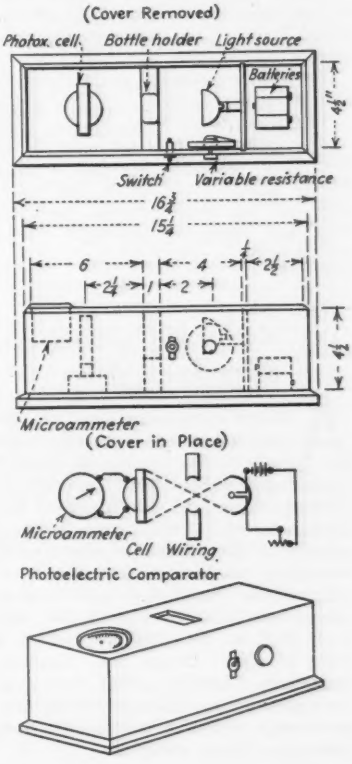
In using the comparator, a set of standard copper solutions are made by adding NH_4OH to a known volume of standard copper sulphate solution and diluting to the proper volume with distilled water. In the work under discussion these standards were made up in 0.02 percent Cu differentials, covering the range between 0.06 percent and 0.34 percent Cu (1.2 percent and 6.8 percent Cu on the solutions).

Medicine bottles of rectangular cross-section and 7-oz. capacity (plus or minus 20 cc.) were found to be satisfactory. These bottles were selected for uniformity by filling with distilled water, placing in the comparator, and rejecting such bottles as did not give the same microammeter reading with a light of constant intensity shining through them on the Photox cell. All bottles used must be uniform when judged by this test.

The standard bottle containing 0.20 percent Cu solution is placed in the comparator and the light intensity adjusted so that the microammeter reading is 7.0. Readings of the instrument with the other standards at the same light intensity of the source are plotted against the respective assays of the standards. This master curve should be checked with new standards at regular intervals, preferably once a week.

In assaying an unknown sample, a 20-gram portion (of tailing pulp) is taken, digested with hydrochloric and nitric acids, and heated with sulphuric acid to fumes. Ammonium hydroxide is added until iron is completely precipitated, followed by 20 cc. in excess. The solution is diluted to 100 cc. plus the volume occupied by the original dry sample. The total volume is

Details of Photoelectric Comparator



thoroughly mixed by shaking vigorously before filtering. A part of the filtrate is used to fill one of the standard bottles for use in the comparator.

The 0.20 percent standard is placed in the comparator and the light intensity adjusted with the variable resistance until the microammeter reading is 7.0. The unknown solution is placed in the comparator in place of the standard and the reading taken without changing the light intensity. Assay of the unknown solution (sample) is read from the mastergraph, using the reading as obtained above.

In the operation of the comparator it is advisable to check the light intensity with standard after determining the reading on the unknown to make sure that the intensity has not changed. It is also advisable to check the curve with standards other than the 0.20 percent Cu at least once a shift to spot possible deterioration of the standards.

When the flashlight batteries run so low that they will not give a reading of plus 10.0 on the microammeter when used with the 0.20 percent Cu standard, they should be replaced with fresh batteries.

The instruments used in the construction of the comparator are listed below. As assembled, the comparator cost slightly less than $30:

Westinghouse Photox cell, Type SW-30, Style #836107 (with prongs for mounting).

Westinghouse industrial socket for above, four pin, Style #7667732.

Westinghouse microammeter, 0.20 microampere range, Type MX (switchboard type), 2-in. diameter, approximately 2,180 ohms, #820159.

Variable resistance—radio rheostat, resistance not known.

Toggle switch.

Acknowledgment is made to N. D. Houghton, engineer, Morenci Branch, Phelps Dodge Corporation, for assistance in the development, construction, and operating technique of the comparator.

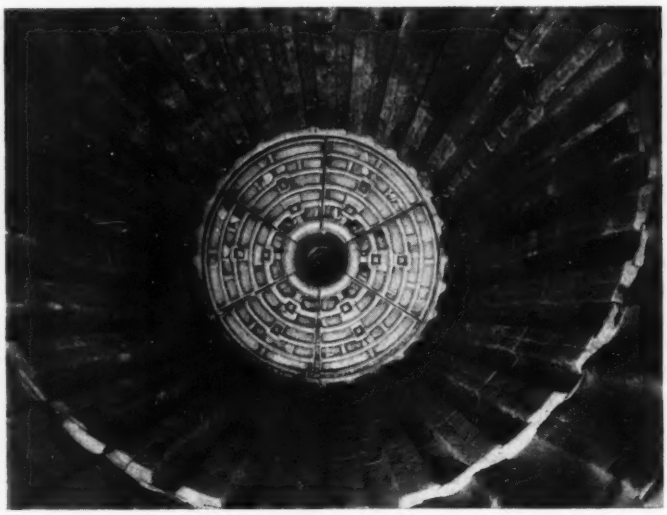
▼ ▼ ▼

Nickel Deposits in Washington

AMONG investigations of domestic deposits of strategic minerals by the Geological Survey, a low-grade nickel deposit near Mount Vernon, State of Washington, has been revealed. It was concluded that reserves of the sulphide-bearing breccia amount to at least 15,000 tons, possibly 50,000 tons, that will average more than 0.20 percent nickel and about 0.02 oz. of gold per ton, or a value of about $2 per ton. This material is so distributed that, to extract the higher-grade material economically, small-scale selective mining methods would have to be used.

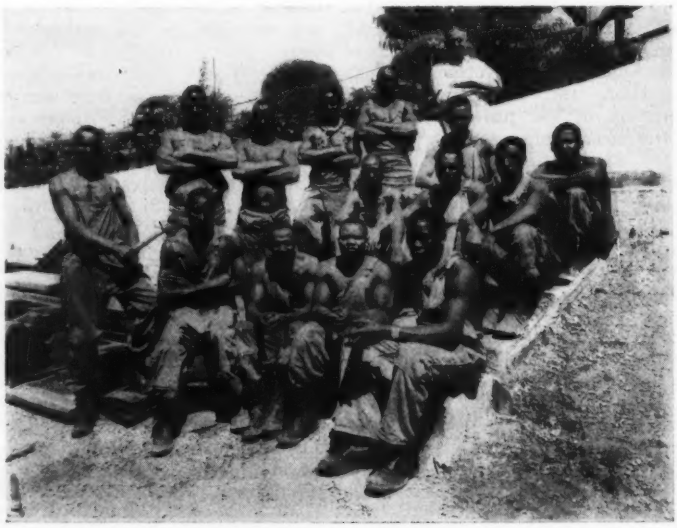
Lining a Tube Mill On the Rand

WE ARE INDEBTED to F. Wartenweiler, consulting metallurgist, for the accompanying notes and illustrations relating to lining a tube mill at Government Gold Mining Areas reduction plant, Witwatersrand, South Africa. The tube mill is 16 ft. long and 6 ft. in diameter. The photograph shows a section of the mill at the feed end, lined with cast white-iron liners held in place by wedging only. The end liner is bolted in place. It takes four hours to complete the lining of this one section, 8 ft. long. This includes emptying mill of pebbles, taking out worn liner, replacing with new liner, and filling mill with pebbles. For the entire mill, 16 ft. long, the time taken for the complete job is eight hours. Another photographic reproduction at the bottom of the page shows the crew of 14 natives which carries out this work.



The Job. Lining a 16 x 6-ft. tube mill with wedged liners

The Crew. Fourteen natives complete the job in eight hours



Unique Portable Sampler For Shallow Placers

It speedily sinks in gravel a small shaft large enough for one man to enter

John Huttl
Assistant Editor

Mounted on the truck platform is the special winch for operating the digging unit

AN INTERESTING PIECE of equipment that has found wide acceptance among dragline dredge operators exploiting shallow placers in the different mining areas of California is a portable placer sampler, locally known as the Par-X placer sampler. It is the result of a long and careful study of the problems and conditions that are encountered in digging test holes mechanically.

In designing the new unit the following requirements had to be considered: (1) The machine must dig a hole large enough for a man to enter to cut a sample if desired and to inspect the ground; (2) a relatively high digging speed; (3) sturdy construction to insure reliable operations and minimum repairs; and (4) it must be mounted in such a way as to be freely mobile over highways as well as rough terrain. The problem was successfully solved by constructing the portable unit shown in the accompanying photographs, consisting essentially of a truck with a steel subframe upon which are mounted the digging unit proper, and auxiliaries.

The mobile mounting for the digging unit consists of a heavy, long, wheelbase truck chassis, with 9.75x20-in. dual rear tires, Browne & Lipe auxiliary transmission, and vacuum booster brakes. Upon it rests a subframe identical in size and shape to that of the truck and made from 12-in. channels, with cross members welded on at suitable points, and three 6x8-in. timbers (on edge). The subframe and the cross timbers, forming the base for the digging unit, are 50 in. above ground and provide clearance for the bucket to dump into the sample cart and its subsequent removal. As the complete assembly is more than 500 lb. "top heavy," a special hand winch is built into the subframe. The sheave is fastened to the bucket when the bucket carrier is to be lowered into moving position, and remains there until the carrier is raised to working position. It is then disconnected, and hangs on the cable under the truck until needed. A rope brake on the winch drum can be used to lower the bucket carrier if desired.

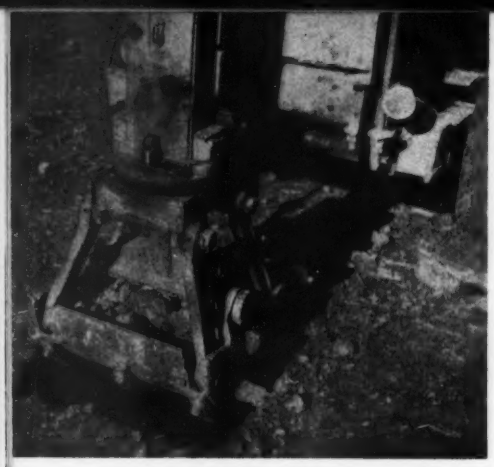
A specially designed clamshell-type bucket, bucket carrier, mast, and guide frame comprise the digging element proper. The bucket is made from $\frac{3}{4}$-in. plate, the ends and sides being electric welded to form the two bucket halves. It is 24 in. square when wide open, and with 2 in. of teeth on both sides makes an over-all cut of 28 in., leaving a 2-in. clearance on both ends as the quarter turns provide a hole 28 in. square.

The five teeth used on the bucket are alloy steel castings, with a chisel point or edge 2 in. thick at the base, and 3 in. wide. They are held securely to the curved sides of the bucket by welded-on back-stop blocks and $\frac{3}{4}$-in. bolts. Worn teeth are built up by electric welding. Use is made of a high-carbon welding rod with a Brinell hardness of 350, and a special rod developed by the American Manganese Steel Co. for final coating. Because of the swivel mounting of the crowd block on the carrier, and the closing line swivel on the closing stem, the entire bucket assembly can be rotated in either direction indefinitely without disturbing cables or adjustments.

The crowd stem, or bucket carrier, is made from two 5-in. channels, placed back to back and spaced evenly 5 in. apart, with $\frac{3}{4}$x8-in. plate welded on the full length. The channels facing outward engage the timbers on the guide frame, while the hollow interior accommodates the cables and operating sheaves. An additional auxiliary is a 30-in. section of extra heavy pipe (outside diameter, 5 in., wall thickness $\frac{3}{4}$ in.), with a steel washer 10 in. in diameter and 1 in. thick welded on 6 in. from one end. This assembly is welded into the carrier with the pipe fitted tightly between the 5-in. channels and against the $\frac{3}{4}$-in. back plate, and the ends of the channels and the back plate butting the washer. On the short, finished end of the pipe operates a 12x13$\frac{1}{4}$-in. steel block containing four 1$\frac{1}{4}$-in. holes with a radius spacing as that on the washer, and a machined 1$\frac{1}{4}$x8-in. alloy steel pin, slightly tapered —an arrangement that effectively locks the crowd block and attached bucket in equal quarter-turn positions. On the lower end of the crowd block are welded four supports made from 1$\frac{1}{2}$x2-in. bar and containing 1$\frac{1}{4}$-in. holes to accommodate the coupling pins holding the crowd arms, which are heavy I-section steel castings with pressed-in steel bushings.

The guide frame for the bucket carrier assembly consists of two 8-in. channels 15 ft. long, placed face to face (channels inside), and spaced the proper distance by welded-on cross channels. Each channel contains a 5-in. channel liner fitted with hardwood guides. The narrower channel is spotted at several points to the main guide frame by welds. Two heavy 1-in. plates with 2$\frac{1}{4}$-in. holes projecting beyond the edge of the guide frame are then welded to the main members at a location 68 in. from the bottom.

The main frame, in which operates the guide frame of the bucket carrier unit, is made up of two 8-in. channels 11 ft. long (channels inside), spaced



Emerging from the 28-in. square shaft the loaded bucket is raised from the hole

evenly at 16¾ in. by four welded-on cross members. The rigid mast is made from two 8-in. channels, each containing a plate with a 2¼-in. hole corresponding to those on the guide frame mentioned previously. To give increased bearing support for the shaft, a 3-in. section of pipe reamed to 2¼ in. is fitted over the shaft and welded to each mast channel and attached plate. The shaft is somewhat longer than required, and is permitted to float so as to prevent wear at any particular point. Stops bolted to the ends make it impossible for the shaft to work out of the bearings.

The special winch used for operating the digging unit is of the triple-drum type. The three gears are spaced evenly around, and run in constant mesh with a centrally situated pinion gear. They also carry a continuous circle of double-faced cone friction blocks engaging circular V-faces in the corresponding drums. Pressure to engage the friction blocks is furnished by adjustable, lever-operated crowd ratchets, and disengagement is effected by cone springs on the shafts between the drum and gear. Thrust bearings of the ball-bearing type back of the gear and between the drum and ratchet afford frictionless operation when pressure is applied. The crowd and holding-line drums have lined brakes actuated by foot pedals, and the closing-line drum has an adjustable, spring-operated "damping" brake to check spin. Gears are of cast iron, machine cut, and have 60 teeth, and bronze bushed hubs. Drums are made from cast iron. They are accurately machined for shaft and frictions, and cored out to form oil reservoirs. The cableway is 8 in. in diameter, 5½ in. wide, and 5 in. deep. Gears, cableways, and other moving parts are covered with appropriate plate guards. Lever and brake, and motor and clutch controls are at the side of the winch to give maximum view to the operator. Differential action is locked with electric welds. The base plate of the unit contains slots to permit chain adjustments, and is secured to the main frame channels by heavy bolts.

Power for the winch is furnished by a Buick 6 standard gasoline automobile motor equipped with a Pierce centrifugal governor. The body of the transmission is cut off just back of the clutch housing, with a suitable support provided for the bearing on the rear end of the splined clutch shaft. Starter, throttle, spark, choke, and gages are installed conveniently near the operator.

Operation of the sampler is relatively simple. As with other mechanical devices, speed and performance are governed largely by the skill and care exercised by the operator. At the digging site the sampler is first levelled and then anchored. After the bucket carrier has been raised to its working position and the raising sheave disconnected, the holding-line lever set to hold the bucket just clear off the ground at the end of the previous operation is released to drop the bucket to the ground. Next, the motor is started, and when properly warmed up the operator first pulls the holding-line lever and raises the bucket about one foot off the ground; then releases it to drop the bucket and drive its teeth into the ground and checking the drum spin at the proper moment by a slight movement of the lever. This operation usually is repeated several times when digging in hard formations or in boulders. When the desired penetration has been effected, the holding-line lever is rested and the crowd-line lever pulled to the proper point. As this drum has sufficient power to lift the entire digging unit, care must be exercised in its operation.

Manipulation of Bucket

The moment the bucket has been properly crowded, the crowd drum pedal is set to hold the pressure and the crowd line to friction released. The closing lever is then pulled, and the bucket closed. Action of this line is compounded through the closing sheave on the closing stem (stroke 12½ in.), so when 25 in. of closing line is drawn in, the crowd brake is released and the holding-line lever quickly pulled to slight tension. Lifting of the loaded bucket is done mostly by the closing line, but the slight tension on the holding line keeps the slack taken up and thus assures proper dropping of the empty bucket. When the loaded bucket has reached the dumping position, the operator partly releases the closing-line friction to allow it to slip, simultaneously pressing the holding-line pedal to free completely the holding-line friction. Next, the helper runs the rubber-tired cart under the loaded bucket, with the operator subsequently releasing the closing-line lever, allowing the bucket to open and dump its load into the cart.

After this has been accomplished, the helper raises the locking pin, gives the bucket a quarter turn, and then removes the cart to the designated dumping site. The operator in turn pulls the crowd lever and simultaneously eases the pressure on the holding-line brake to allow it to slip with moderate pressure, while the crowd line pulls the carrier and bucket down to the bottom of the hole. At this point the crowd lever is released and the holding-line brake completely freed.

The crowd line is used to pull the carrier unit down rather than permitting it to slip or drop of its own weight, as this keeps all lines tight, with the closing line unwinding from its drum as the bucket descends and the spring damping brake checking any further spin as it reaches the bottom of the hole. This brake also tends to check the spin when the closing-line friction is released to dump the bucket load into the cart. Occasionally, it is necessary to check the drum spin by a timely pull on the operating lever, as conditions in the drums vary because of moisture, temperature and oil. When the bucket has reached the bottom of the hole and the holding-line brake and the crowd lever have been released, the routine described in the foregoing is repeated.

When digging in normal ground, an average full bucket represents about 1 in. of hole. Where boulders are encountered it is desirable to turn the bucket a half turn instead of a quarter turn or to reverse it a quarter turn in order better to attack the obstacle. The large nut on the main closing stem just below the closing swivel is so adjusted as to set the outer face of the bucket teeth as nearly vertical as possible. If set too far, the bucket is harder to close, and the teeth do not get a downward penetration. Closing of the bucket as the teeth strike the ground and inability to dig a full-size hole in solid or sticky formations may result if the teeth should be set in too far.

The present equipment is designed for a maximum depth of 30 ft., though the truck mountings are sufficiently stable to carry from 10 to 15 ft. more carrier and still be reasonably mobile on the road. Obviously, more top-heaviness means more effort to raise and lower the carrier, but as most jobs carried out so far have required less than the maximum 30-ft. depth, no longer carrier has been required. Digging speed averages 35 ft. per day in normal ground, and two holes, or more than 72 ft., were completed recently in one day in the Lincoln placer area, where digging conditions were more than favorable.

Operations of the various Par-X sampler units active in the field are directed by H. G. Strain, general manager, Cottonwood, Shasta County, Calif., to whom thanks are due for the data given in this article.

TOPAZ
A New Industrial Mineral

Long mistaken for quartz, it occurs as placer gravel at the old Brewer gold mine, in South Carolina. Tests made indicate prospective uses

B. C. Burgess

Vice President, United Feldspar & Minerals Corporation
Spruce Pine, N. C.

Test pits 15 to 30 sq.ft. in area and 12 in. deep were dug at 50- and 100-ft. intervals. The topaz fragments 1½ in. in size and larger were thrown out on one side and the dirt was ejected on the other

DURING the hundred years of intermittent operation at the Brewer gold mine, in South Carolina, surface material has been shoveled in and out of sluices and tumbled over screens until the hard lumps contained in it have acquired the appearance of water-worn gravel. Over 30 years ago Graton[1] suspected the presence of topaz. But it was not until 1937 that members of the U. S. Geological Survey[2] actually got to work on this much-handled placer gravel and pronounced it topaz.

The Brewer mine is in Chesterfield County, about 12 miles from the North Carolina line. The lode is about 750 ft. wide and extends nearly half a mile, forming a broad ridge about 200 ft. high between Little Fork Creek and Lynch's River. The country rock has been described as quartz-sericite schist by Glass[3] and others. It resembles the rock in which the ore is found at the Haile mine; also the series in which pyrophyllite occurs in Moore and Randolph Counties, N. C. (The country rock at the Brewer mine contains several well-defined lenses of pyrophyllite.) Weathering is irregular in extent, reaching to 60 ft. or more in places.

The principal evidence of former gold mining is the Brewer pit, approximately 300 ft. in diameter and 140 ft. deep. An adit about 1,400 ft. long from an old stamp mill site on Lynch's River connects with the bottom of this pit. Other tunnels have been run into the walls and from the bottom, one over 400 ft. long being driven to the north. There are also a smaller pit, southwest, and two placer areas covering 20 to 30 acres.

One of these placer areas lies along the north and west sides of the Brewer pit. Here the topaz is found. The soft ground was first dug and screened and the fines were taken to the river for washing. Later, water was pumped up to the area, tailings piles indicating that sluicing was done at numerous points. Some of these piles are estimated to be about half topaz. Float topaz is found over 15 acres, and surface prospecting shows four acres to contain an average of 10 lb. of topaz per cubic foot. At one point near the center of this area there is a hard rock outcrop about 25 by 50 ft. in dimensions made up of quartz and topaz in aggregates large enough to permit a high-grade topaz product to be obtained by hand-cobbing.

A preliminary examination of the tunnel driven north from the bottom of the Brewer pit shows three streaks of topaz. Pardee[2] describes occurrences grading from practically 100 percent quartz to 100 percent topaz on the south side of the pit.

The Brewer topaz has a waxy luster and a hardness of 7 to 8. It breaks with conchoidal fracture, also along parallel and angular joint planes, resulting in rectangular and wedge-shaped pieces. The color is white, gray, brown, black, mottled, streaked, and banded. Some pieces show brown to carnelian red when broken, probably due to oxidation of inclusions of fine pyrite grains. The indices of refraction reported by Glass[3] are X = 1.629, B = 1.631, Y = 1.638.

Before any effort was made to recover the topaz it appeared that a large quantity was scattered as loose pebbles and rocks on the surface. This proved misleading. Actual weight of such topaz amounted to only 111 tons.

Test pits were then dug to determine the penetration of the topaz into the earth. These showed practically all of it in the first 12 in. The area was then laid out for test pits on 100-ft. centers S. 35 deg. E. and 50-ft. centers N. 55 deg. E.

Pits 12 in. deep and 15 to 30 sq.ft. in area were then dug at the intersections. Topaz fragments 1½ in. and larger were thrown out on one side and the dirt was thrown on the other. Where advisable, closer spacing was used. Subsequently a map was made showing location and area of the pits and the pounds of topaz recovered from each. Two areas were thus determined in which the concentration of pieces of topaz 1½ in. or larger was 1 lb. or more to the square foot. Values were then interpolated for the boundary lines and the average number of pounds of topaz in fragments 1½ in. or larger in size in each area was computed. The smaller area, 40,000 sq.ft., was found to average 7½ lb. per square foot and the larger area, 120,000 sq.ft., 11 lb., a total of 810 tons for the two.

Dirt from a representative number of pits was then screened and the weight of topaz pieces smaller than 1½ in. in size down to about ½ in. was determined. This was found to be approximately twice that of the topaz found in each pit, or 1620 tons for the two areas.

The rock outcrop near the center of area of greatest surface concentration

Table I—Analyses and Specific Gravities of Samples

	1 (*a*)	2 (*b*)	3 (*c*)	4 (*d*)	5 (*e*)
Silica	33.00	38.50	60.90	79.10	98.08
Alumina	56.76	50.79	35.54	18.28	1.16
Iron (Fe_2O_3)	T	0.81	1.46	1.72	0.03
Fluorine	13.23	10.44	7.52	2.94	....
Specific gravity	3.50	3.40	3.06	2.84	2.65
Estimated % topaz	100	82	52	22	0
Estimated % quartz	0	18	48	78	100

(*a*) Selected massive topaz, see Jewell J. Glass (footnote 3); (*b*) Sample from stockpile of float topaz; (*c*) Grab sample from outcrop; (*d*) Rejects from carload of selected topaz; (*e*) Vein quartz

[1] Graton, L. C.: "Reconnaissance of Some Gold and Tin Deposits of the Southern Appalachians." U.S.G.S. Bull. 293, pp. 90, 1906.

[2] Pardee, J. T.; Glass, Jewell, J., and Stevens, R. E.: "Massive Low-Fluorine Topaz from the Brewer Mine, S. C." *American Mineralogist*, Vol. 22, No. 10, Oct., 1937.

[3] Glass, Jewell J.: "Extraordinary Topaz-Replacement Body in the Brewer Mine, S. C." Transactions of the American Geophysical Union, Eighteenth Annual Meeting, 1937.

of the topaz has been previously mentioned. Topaz in place also shows in the pits 20 to 50 ft. northeast and northwest of this outcrop. At each of these points the occurrence of the topaz is so similar to that in the north tunnel that one is justified in considering that the topaz extends in a more or less continuous body from the tunnel to the surface.

The question of length and thickness of this topaz shoot is now to be determined. In our calculations we used a length of 50 ft. It seems possible that this may be only a short portion of the total length, because the float material is found for more than 1,000 ft. in this direction. The thickness of this shoot was taken as 8 ft., the actual width of topaz represented by the samples. As the specific gravity tests were made on these samples (Table II), it appears there may be much greater widths of similar material and strata of lower topaz content not observed in the short time available for examination.

The total amount of vein topaz calculated as in the foregoing is found to be 12,000 tons. Summarizing:

Surface topaz, plus 1½ in....	810 tons
Surface topaz, minus 1½ in. plus ½ in.....	1,620 tons
Vein topaz.....	12,000 tons
Total	14,430 tons

Pardee[2] mentions topaz-quartz associations in place on the south side of the Brewer pit varying from practically 100 percent quartz to 100 percent topaz; also in the summary of the report[3] we find the statement: "Topaz of a fine-grained chert-like character forms a large part of the gold-bearing lode at the Brewer mine."

From this it would appear that our work to date has disclosed but a small part of the topaz available at this unique deposit. However, we feel that enough has been blocked out to warrant commercial interest and the making of tests to determine uses possible.

The tests—The capacity of a pebble mill grinding feldspar, flint, and other ceramic materials may be increased by using grinding media of greater specific gravity. Steel balls are not used, for fear of contaminating the product with iron. The war has made it difficult to obtain the French, Danish, and Belgian pebbles which have hitherto been in general use.

On account of the hardness and relatively high specific gravity of topaz it appeared to have possibilities as a grinding media, and our first tests were in this direction.

Pieces of float topaz were selected as nearly cubical and as free from cracks as could be found. Fifteen-hour grinding tests were conducted with these in a laboratory mill against similar tests with Belgian flint pebbles. Equal volumes of topaz and flint with feldspar crushed to pass a ¼-in. sieve showed about 20 percent surface increase in favor of the topaz. However, the loss of weight of the topaz was much greater than that of the flint. This was no doubt due to the fact that the flint was smooth and well-rounded, the topaz rough and angular.

A batch of topaz is to be run in a pebble mill of commercial size until smooth well-rounded pebbles result. These tests will be repeated.

The next test was as to the possibility of using topaz as a flux in making steel, for its fluorine content. It was conducted by a prospective customer and our understanding is that he found that topaz could be used to replace fluorspar but that the price would have to be much lower.

The third test was in respect to the use of topaz as a refractory after calcining. It was found that all the fluorine could be driven off by calcining at 1,340 deg. C: (2,444 deg. F.). Data on the product before and after calcining are as follows:

	Before Calcining	After Calcining
SiO_2	40.20	28.90
Al_2O_3	50.28	71.06
Fe_2O_3	0.92	0.22
F_2	12.74	0.15
	104.14	100.33
Specific Gravity.....	3.45	2.91

It will be noted from these analyses that the fluorine in volatilizing took with it most of the iron and a large part of the silica.

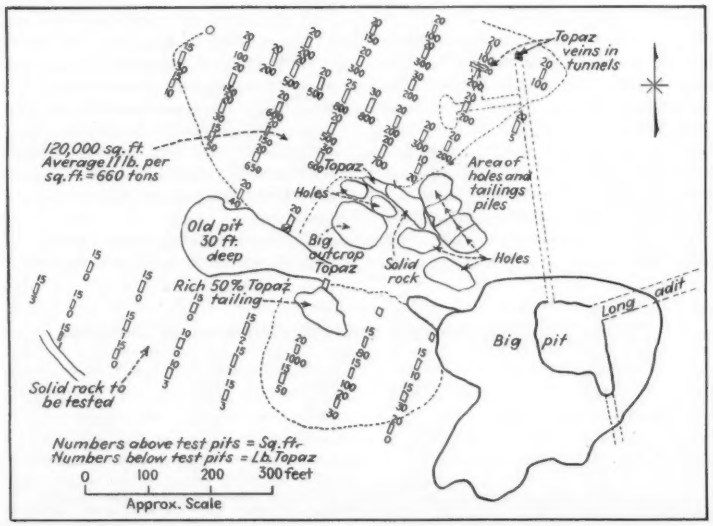
The P C E of the calcined material was found to be cone 40, equivalent to 1,885 deg. C., (3,425 deg. F.). During the calcination there was a total expansion of 1.20 percent and a permanent expansion of only 9.75 percent.

Table II—Specific Gravities of Samples from Topaz Shoot

Sample No.	Wt. in Air Lb., Oz.	Wt. in Water Lb., Oz.	Specific Gravity	% Topaz (*a*)	Description
1	9–9	6–11	3.32	79	Left side north tunnel at 400 ft.
2	4–2	2–15	3.47	96	Left side north drift, last CC
3	1–0	0–10	2.67	2	Left side north tunnel at 300 ft.
4	2–11	1–10	2.53	0	Left side north tunnel at 250 ft.
5	7–15	5–10	3.43	92	Apex of outcrop
5*a*	1–11	1–3	3.37	85	10 ft. south apex of outcrop
6	1–0	0–11	3.20	65	50 ft. north apex of outcrop
7	2–1	1–7	3.30	76	Vein in hole north outcrop
8	1–1	0–12	3.40	88	Average float

(*a*) Percent topaz estimated from specific gravity 3.50 for topaz and 2.65 for quartz.

Sketch showing the Brewer pit and underground workings and the adjacent prospecting work for topaz


Topaz veins in tunnels
120,000 sq. ft. Average 11 lb. per sq. ft. = 660 tons
Topaz
Area of holes and tailings piles
Holes
Old pit 30 ft. deep
Big outcrop Topaz
Solid rock
Holes
Rich 50% Topaz tailing
Long adit
Big pit
Solid rock to be tested
Numbers above test pits = Sq. ft.
Numbers below test pits = Lb. Topaz
0 100 200 300 feet
Approx. Scale

Prospective Uses

From these and other tests which are under way the following prospective uses of topaz are suggested:

Grinding Pebbles—By selection of material free from joint planes and by hand-cobbing and milling to obtain a shape approaching spherical and smooth or rounded edges.

Flux for Steel Making—By jigging or other gravity concentration of the finer surface material and vein material fines.

Superduty and High-Alumina Refractory—By selecting low-quartz surface or vein material, or concentrates.

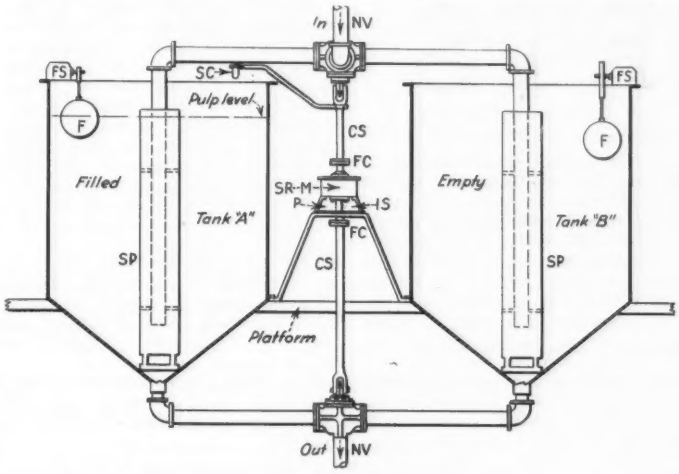
Source of Mullite—For porcelain such as spark plugs and electrical porcelain; selected and concentrated topaz.

Abrasives—By crushing and sizing selected vein material or classifying high-grade concentrates from vein material.

Novel Slime Meter and Sampler

D. L. King

Mill Superintendent The Mountain Copper Co., Ltd., Matheson, California



Legend

NV	3" Nordstrom, three-way, two-port valve	SC	Sample cup	FC	Flexible coupling
P	Engagement pin for actuating limit switches	FS	Floatswitch	SR-M	Speed reducer
SP	Splash pipe to keep entering pulp quiescent	F	Float	IS	Limit switches
CS	Connecting shaft, 15/16" Dia.				

In this diagram the float switch is nearly up to high position on tank "A." Tank "B" is completely empty. Pulp is still entering Tank "A," and has drained from tank "B." In another fraction of an inch the pulp level in "A" will rise high enough to close float switch. When this occurs the coil circuit of the reversing line starter is closed, which energizes the motor and effects a 90-deg. rotation, thus letting pulp enter tank "B" and draining "A." This movement also effects cutting and delivery of an aliquot sample to the sample container, and records one count on the magnetic counter (energized by the close of "A" floatswitch). Tank "A" then will drain entirely before tank "B" fills. When the latter fills to its high level point, the reversing coil circuit will be completed by the closing of "B" float switch, causing the meter to return to the "A" filling cycle shown. No sample is cut from "B" filling cycle, and no count is recorded on the Veeder-Root counter.

MEASURING of slime tonages in most ore-treatment plants is accomplished by diverting either all or part of the pulp stream into a calibrated container and noting the length of time required to fill it to a predetermined level. After this period is timed a sample of the pulp is then taken and the solids content determined. From the percent solids in the sample and the volume of the pulp passing (calculated from the time interval required to fill the container to a known volume) the true tonnage of slimes can be ascertained accurately for the period during which the determination is made. As accuracy of this method depends on the uniformity of volume, gravity of the pulp stream, and frequency of determinations, it is obvious that, for most plants, this system is faulty as an accurate method of tonnage determination.

As standard flow meters are not adaptable to measuring of abrasive and corrosive pulps, and since it is desirable to measure and sample the entire pulp flow, the Mountain Copper Co., Ltd., at its Iron Mountain cyanide plant, Matheson, Calif., developed a metering and sampling unit that handles the entire output of the slimes plant (up to 340 tons per day).

The device essentially consists of two reinforced, open-topped, taper-bottom, steel metering tanks, each 4 ft. in diameter and 4 ft. high, mounted side by side on a platform. Final thickener underflow pumped by the washing thickener diaphragm pump flows by gravity into one tank through the open port of a three-way, two-port, 3-in. Nordstrom valve. Pulp leaves the opposite tank through the open port of a 3-in. valve, identical in make and design as that used in the intake line.

Each tank is equipped with a Square D single-throw, double-pole, high-level float switch which completes the coil circuit of a Westinghouse reversing line starter the moment the inflowing pulp reaches a predetermined level, and thus causing a ½-hp., three-phase motor running at 1,750 r.p.m. and direct-connected to a Boston VAAW, 450:1, vertical speed reducer to revolve a connecting shaft between the two Nordstrom valves through a 90-deg. arc. The motor is stopped at the completion of the 90-deg. arc by a shaft pin opening a G.E. limit switch in series with the float switch-line starter circuit. The Nordstrom valves are installed as indicated in the accompanying line drawing. Valve ports are mounted at 180 deg. to each other, so that when the feed valve port is open on "A" tank the discharge port is open on "B" tank, and vice versa. Use of the three-phase motor, controlled by the reversing line starter, makes possible the required clockwise and counter-clockwise rotation of the valve connecting shaft. The float switch at the top of each tank permits starting of the motor in the proper direction of rotation, while its corresponding pre-set limit switch assures opening of the coil circuit to stop rotation of the connecting shaft at completion of each respective 90-deg. arc.

A magnetically controlled Veeder-Root counting unit records the number of cycles made by the machine during any period. The known volume of the meter tanks (from complete discharge point to the high-level switch line) multiplied by the number of cycles recorded on the counting unit gives a true volume of pulp passing the meter during any period. Differential buoyancy, because of variations in gravity of the pulp during any period, does not result in a measurable difference in the height of the cutoff point of the high level switch floats.

In order that an accurate sample can be cut from each cycle of the meter, an arm is mounted on a keyed hub setscrewed to the valve interchange connecting shaft. On this arm is swung a sample cup, which at each change between filling of "A" tank to the filling of "B" tank passes under a split stream of the pulp. As the interchange connecting shaft completes its 90-deg. arc, the sample cup (now holding an aliquot part of pulp) swings over an incline track, causing the cup to be tipped through 170 deg. and thus spilling the contents into a funnel connected to a hermetically sealed sample container. The sample taken and collected in this manner forms a representative sample of the pulp passing the meter during any period, and can be used for determination of specific gravity (percent solids) and for assay purposes. After having arrived at the true volume passing the meter during any period and the percent solids of the pulp determined, it is a matter of simple arithmetic to find the true tonnage of dry solids handled during that period.

The device can be made to function in pulps of any density or viscosity, and at any tonnage or volume. The only governing condition is that the pulp must be completely discharged from the outgoing tank before the incoming tank completes its filling period.

Summary of the

MARKETS

PRESSURE from Washington dominates all business in non-ferrous metals. The ceiling of 12c. on copper became effective Aug. 12, and not on the 6th as originally implied. An attempt was made during August to raise the price of antimony, but this move was frowned upon by the price control division and an uplift of one-half cent a pound was canceled. Major producers of cadmium indicated a willingness to continue selling that metal on the basis of 90c. a pound.

Another price warning was issued on quicksilver and the market tension eased somewhat as buyers were informed of a sufficiency in the supply. It was pointed out that Mexico's production, averaging around 2,400 flasks a month, will be brought into this country. Domestic production of quicksilver has increased to 4,000 flasks a month. Priority control was extended to tungsten ore, regardless of source. A ceiling of 52c. a pound was established for "Grade A" tin, effective Aug. 16.

Though aluminum production is being earmarked for defense, the leading interest announced that the price will be reduced 2c. a pound, to 15c., after Sept. 30. The downward trend in aluminum prices naturally disturbs the long-range outlook in competing metals, chiefly copper and zinc.

Domestic sales of copper for August amounted to 85,729 tons, against 99,912 tons (revised) in July. The sales totals do not include foreign metal released by the Metals Reserve Company. Negotiations to renew the contract for Chilean copper have been opened but progress has been slow because of a difference in opinion about prices. The Chilean authorities have been holding out for a higher price than the 10c. basis paid previously, largely because of a tax problem.

The zinc pool for September was set at 27 percent of production. Producers of zinc concentrate in the Tri-State district have been reluctant sellers, believing that higher prices should obtain under present circumstances.

The *E.&M.J.* price index for August was 83.39, against 83.60 for July, reflecting lower monthly averages for copper and tin.

UNITED STATES MARKET

1941 Aug.	Electrolytic Copper: Domestic (a) Refinery	Electrolytic Copper: Export (b) Refinery	Straits Tin: New York	Lead: New York	Lead: St. Louis	Zinc: St. Louis
1	11.800	10.950	52.750	5.85	5.70	7.25
2	11.775	10.950	52.750	5.85	5.70	7.25
4	11.800	10.950	52.750	5.85	5.70	7.25
5	11.800	10.950	52.125	5.85	5.70	7.25
6	11.775	10.950	52.250	5.85	5.70	7.25
7	11.775	10.950	52.875	5.85	5.70	7.25
8	11.775	10.950	53.000	5.85	5.70	7.25
9	11.775	10.950	53.000	5.85	5.70	7.25
11	11.775	10.950	53.000	5.85	5.70	7.25
12	11.775	10.950	53.000	5.85	5.70	7.25
13	11.775	10.950	53.000	5.85	5.70	7.25
14	11.775	10.950	53.000	5.85	5.70	7.25
15	11.775	10.950	52.500	5.85	5.70	7.25
16	11.775	10.950	52.000	5.85	5.70	7.25
18	11.775	10.950	52.000	5.85	5.70	7.25
19	11.775	10.950	52.000	5.85	5.70	7.25
20	11.775	10.950	52.000	5.85	5.70	7.25
21	11.775	10.950	52.000	5.85	5.70	7.25
22	11.775	10.950	52.000	5.85	5.70	7.25
23	11.775	10.950	52.000	5.85	5.70	7.25
25	11.775	10.950	52.000	5.85	5.70	7.25
26	11.775	10.950	52.000	5.85	5.70	7.25
27	11.775	10.950	52.000	5.85	5.70	7.25
28	11.775	10.950	52.000	5.85	5.70	7.25
29	11.775	10.950	52.000	5.85	5.70	7.25
30	11.775	10.950	52.000	5.85	5.70	7.25
AVERAGES FOR MONTH						
Aug.	11.778	10.950	52.385	5.850	5.700	7.250
AVERAGES FOR WEEK						
6	11.792	10.950	52.479	5.850	5.700	7.250
13	11.775	10.950	52.979	5.850	5.700	7.250
20	11.775	10.950	52.250	5.850	5.700	7.250
27	11.775	10.950	52.000	5.850	5.700	7.250
CALENDAR WEEK AVERAGES						
'2	11.788	10.950	53.292	5.850	5.700	7.250
'9	11.783	10.950	52.667	5.850	5.700	7.250
16	11.775	10.950	52.750	5.850	5.700	7.250
23	11.775	10.950	52.000	5.850	5.700	7.250
30	11.775	10.950	52.000	5.850	5.700	7.250

SILVER, GOLD AND STERLING EXCHANGE

1941 Aug.	Sterling Exchange: "Checks" (Nominal)	Sterling Exchange: "90-day demand"	Silver (c): New York	Silver (c): London	Gold: London	Gold (d): United States
1	401.000	(f)	34.750	23.4375	168s	$35.00
2	401.000	(f)	(e)	(e)	(e)	35.00
4	401.000	(f)	34.750	Holiday	Holiday	35.00
5	401.000	(f)	34.750	23.5000	168s	35.00
6	401.000	(f)	34.750	23.4375	168s	35.00
7	401.000	(f)	34.750	23.4375	168s	35.00
8	401.000	(f)	34.750	23.4375	168s	35.00
9	401.000	(f)	(e)	(e)	(e)	35.00
11	401.000	(f)	34.750	23.4375	168s	35.00
12	401.000	(f)	34.750	23.5000	168s	35.00
13	401.000	(f)	34.750	23.4375	168s	35.00
14	401.000	(f)	34.750	23.4375	168s	35.00
15	401.000	(f)	34.750	23.4375	168s	35.00
16	401.000	(f)	(e)	(e)	(e)	35.00
18	401.000	(f)	34.750	23.4375	168s	35.00
19	401.000	(f)	34.750	23.4375	168s	35.00
20	401.000	(f)	34.750	23.4375	168s	35.00
21	401.000	(f)	34.750	23.4375	168s	35.00
22	401.000	(f)	34.750	23.4375	168s	35.00
23	401.000	(f)	(e)	(e)	(e)	35.00
25	401.000	(f)	34.750	23.5000	168s	35.00
26	401.000	(f)	34.750	23.5000	168s	35.00
27	401.000	(f)	34.750	23.5000	168s	35.00
28	401.000	(f)	34.750	23.5000	168s	35.00
29	401.000	(f)	34.750	23.5000	168s	35.00
30	401.000	(f)	(e)	(e)	(e)	35.00
AVERAGES FOR MONTH						
Aug.	401.000 Nominal		34.750	23.459	....	35.00
AVERAGES FOR WEEK						
6	401.000	....	34.750	.....	....	.....
13	401.000	....	34.750	.....	....	.....
20	401.000	....	34.750	.....	....	.....
27	401.000	....	34.750	.....	....	.....

Calendar week averages, New York Silver; Aug. 2d, 34.750; 9th, 34.750; 16th, 34.750; 23rd, 34.750; 30th, 34.750.

(e) Not quoted (Saturday). (f) No quotation.

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.225c. per pound, the average differential for freight and delivery charges.

(b) Export prices are net at refineries on the Atlantic seaboard and include sales of domestic copper in the foreign market. Owing to the European War and the disruption of normal trade relations, our export copper quotations, since September, 1939, have been based largely on f.a.s. transactions, ex United States ports. To arrive at the f.o.b. refinery quotations deduct .05 from the f.a.s. basis for lighterage.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes are sold at a discount of 0.125c.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade Zinc delivered in the East and Middle West in nearly all instances command a premium of 1c per pound over the current market for Prime Western but not less than 1c over the *Engineering and Mining Journal's* average quotation for Prime Western for the previous month.

Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

(c) Silver other than newly-mined domestic, by Handy & Harman. Under Treasury order of July 6, 1939, the price on domestic newly-mined silver mined subsequent to July 1, 1939, was fixed at 71.11c per troy ounce. Handy & Harman's quotation on newly-mined domestic silver, 999 fine was 70⅝c throughout August.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold in domestic and imported ore or concentrate is at 99.75 per cent of the price quoted by the Treasury, which at present is equal to $34.9125.

LONDON MARKET

Aug. 1941	Tin—Standard—Spot	Tin—Standard—3 months
1	256.2500	259.7500
4	Holiday	Holiday
5	256.5000	259.7500
6	256.7500	259.7500
7	256.5000	259.7500
8	256.5000	259.7500
11	257.0000	259.7500
12	258.0000	260.2500
13	258.7500	260.7500
14	258.7500	260.5000
15	258.2500	260.2500
18	257.5000	260.5000
19	257.2500	260.0000
20	256.7500	259.7500
21	256.5000	259.5000
22	256.2500	259.7500
25	256.2500	259.7500
26	256.0000	259.7500
27	256.5000	259.7500
28	256.7500	259.7500
29	257.2500	259.7500
Average for month	257.013	.....

Official tin prices on London Metal Exchange in long tons, pound sterling. Trading in copper, lead, and zinc suspended August 31, 1939.

Weekly MARKET INFORMATION Service

- E&MJ Metal & Mineral Markets, the weekly price information service of Engineering & Mining Journal, will keep you in close touch with effects of war developments on costs and availability of metals and non-metallic minerals.
- Printed and mailed every Wednesday night, E&MJ Metal & Mineral Markets will speed to you as special newspaper mail. It carries daily and weekly average prices of metals for the preceding six market days.
- Rates: $5 a year in the United States and possessions, and in the Americas; $10 a year elsewhere. Address:

E&MJ METAL & MINERAL MARKETS

Dept. 101 330 West 42nd Street New York, N. Y.

CURRENT PRICES — MISCELLANEOUS METALS, ORES, AND NON-METALLIC MINERALS

Quotations cover wholesale lots, prompt shipment, f.o.b. New York, unless otherwise stated

(Sept. 1, 1941)

MISCELLANEOUS METALS

Aluminum, ingot, 99 plus per cent, lb	17c.
Antimony, domestic, spot, lb	14.00c.
Bismuth, ton lots, lb	$1.25
Cadmium, commercial sticks, lb	90c.
Calcium, lb., ton lots 97 @ 98 per cent	$1.25
Chromium, 97 per cent grade, lb	85c.
Cobalt, 97 to 99 per cent, per lb	$1.50
Nickel, electrolytic cathodes, lb	35c.
Magnesium, 99.8 per cent, carloads, lb	27c.
Palladium, troy oz	$24.00
Platinum, (Official quotation) troy oz	$36.00
Quicksilver, flask of 76 lb., 100 flasks or more	$192.60
Radium, mg. radium content	$25.00@$30.00
Selenium, 99.5 per cent, lb	$1.75
Silicon, minimum 97 per cent, spot, lb	16.50c.
Tellurium, lb	$1.75
Thallium, 100 lb. or more, lb	$10.00
Titanium, 96 to 98 per cent, lb	$5.00

METALLIC ORES

Beryllium Ore, f.o.b. mines, ton	$30.00@$35.00
Chrome Ore, 48 @ 50% Cr_2O_3 c.i.f. Atl. ports, long ton	(b)$45.00@$48.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$4.75
Mesabi bessemer	$4.60
Old Range non-bessemer	$4.60
Mesabi, non-bessemer	$4.45
Lead (Galena) 80 per cent, Joplin, Mo., ton	$68.64
Manganese Ore, (foreign) c.i.f. U.S. ports, long ton unit of Mn:	
52 @ 55 per cent	(b) 70c.
50 @ 52 per cent	(b) 70c.
46 @ 48 per cent	(b) 65c.
Molybdenum Ore, 90%, per lb. of MoS_2, f.o.b. mines	45c.
Tungsten Ore, per unit of WO_3:	
Chinese, 65 per cent, duty paid	(b) $24.50
Domestic, 65 per cent and upward	(a)$24.00@$25.00
Vanadium Ore, per lb. of contained V_2O_5	27½c.
Zinc Ore, Prime, 60 per cent concentrate, Joplin, Mo.; per ton	$48.00

(a) Prices at mines, small lots, usually several dollars less. (b) Nominal.

METALLIC COMPOUNDS

Arsenious Oxide (arsenic) lb	4c.
Cobalt Oxide, 70 @ 71 per cent, lb	$1.84
Copper Sulphate, 100 lb	$5.00
Sodium Nitrate, ex vessel, in 200-lb. bags, per 100 lb	$1.43
Sodium Sulphate, bulk, ton	$18.00@$24.00

ALLOYS

Beryllium Copper, master alloy, 2.5 to 3 per cent Be. per lb. of contained Be	$15.00
Ferrochrome, 65 @ 70 per cent chromium, 4 @ 6 per cent carbon, per pound of Cr contained	11c.
Ferromanganese, 78 @ 82 per cent, gross ton	$120.00
Ferromolybdenum 55 @ 65 per cent Mo. lb. of Mo. contained	95c.
Ferrosilicon, 50 percent, gross ton	$74.50
Ferrotungsten, 75 @ 80 per cent, lb. of W contained	$1.90@$2.00
Ferrovanadium, per lb. of V, delivered	$2.70@$2.90

NON-METALLIC MINERALS

Asbestos, f.o.b. Canadian (Quebec) mines (U.S. funds), ton;	
Crude No. 1	$700@$750
Crude No. 2	$150@$350
Spinning fibers	$110@$200
Paper stock	$40@$49.50
Shorts	$13@$17.50
Vermont, f.o.b. Hyde Park:	
Shingle stock	$57.00@$60.00
Paper stock	$40.00@$48.00
Shorts	$13.00@$26.00
Floats	$18.00
Barytes, long ton:	
Georgia, crude	$8.00
Missouri, 93 per cent $BaSO_4$, less than 1 per cent iron	$6.00@$6.50
Bauxite, long ton:	
Domestic, crude, 50 @ 52 percent (not dried)	$5.00
Domestic, chemical, 55 @ 58 per cent	$7.50@$8.50
Domestic, abrasive 80 @ 84 per cent	$16.00
China Clay, f.o.b. mines, ton:	
South Carolina and Georgia, No. 1, bulk	$6.75@$8.00
Delaware, No. 1	$14.50
Feldspar, bulk, ton:	
Potash feldspar, 200 mesh	$17.00
Glass-spar, white, 20 mesh	$11.75
Fluorspar, f.o.b. mines, bulk, Kentucky and	
Illinois 85–5 per cent, all rail movement, ton	$22.00
Ground, 95 @ 98 percent, bulk, ton	$31.00
Lump, acid, 98 percent, bulk, ton	$27.00
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00@$14.00
Magnesite, per ton:	
Dead-burned, f.o.b. California	$25.00
Dead-burned, f.o.b. Washington	$22.00
Mica, per lb., North Carolina, No. 1 and 2 quality:	
1½ x 2 in.	45@65c.
2 x 2 in.	60@85c.
3 x 3 in.	$1.85@$2.05
3 x 4 in.	$2.15@$2.25
3 x 5 in.	$2.50@$2.75
White, ground, 70 mesh, ton	$60.00@$80.00
Ocher, Georgia, ton	$19.00@$22.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	(a) 12c
Silica, in bags, 325 mesh, ton	$20.00@$40.00
Sulphur, Texas, mines, long ton	$16.00
Talc, f.o.b. works, ton:	
New York, double air-floated, 325 mesh	$12.00@$15.00
New Jersey, mineral pulp	$8.50@$10.50
Vermont, extra white, 200 mesh	$9.50@$10.00
Tripoli, Missouri, ton:	
40 mesh, cream colored	$14.50
200 mesh, cream colored	$26.00

(a) Nominal

IRON AND STEEL

Pig Iron, Valley furnaces, gross ton:	
Bessemer	$24.50
Basic	$23.50
No. 2 Foundry	$24.00
Steel, base prices, Pittsburgh:	
Billets, gross ton	$34.00
Structural shapes, 100 lb	$2.10
Bars, 100 lb	$2.15

Monthly and Yearly

AVERAGE PRICES

SILVER AND STERLING EXCHANGE

	New York		London Spot		Sterling Exchange	
	1940	1941	1940	1941	1940	1941
January	34.750	34.750	21.892	23.273	395.442	(a) 402.000
February	34.750	34.750	20.935	23.341	395.652	(a) 401.864
March	34.750	34.750	20.763	23.446	375.212	(a) 401.788
April	34.750	34.750	20.713	23.500	351.817	(a) 401.058
May	34.949	34.750	21.878	23.457	326.452	(a) 400.981
June	34.825	34.750	22.688	23.400	359.560	(a) 401.000
July	34.750	34.750	22.095	23.397	379.750	(a) 401.000
August	34.750	34.750	23.261	23.459	396.889	(a) 401.000
September	34.750	.....	23.446	.....	401.646	.....
October	34.750	.....	23.451	.....	401.692	.....
November	34.750	.....	23.238	.....	401.783	.....
December	34.750	.....	23.015	.....	402.000	.....
Year	34.773	.....	22.281	.....	382.325	.....

New York quotations for silver other than newly-mined domestic, cents per ounce troy, 999 fine, London pence per ounce sterling silver 925 fine. Sterling exchange (pound sterling) in cents. (a) Nominal

COPPER

	F.O.B. Refinery, Electrolytic			
	Domestic		Export	
	1940	1941	1940	1941
January	11.954	11.819	11.999	10.257
February	11.148	11.794	11.471	10.414
March	11.160	11.814	11.407	10.592
April	11.087	11.820	11.258	10.952
May	11.079	11.815	11.191	10.950
June	11.128	11.810	11.216	10.950
July	10.564	11.812	10.189	10.950
August	10.708	11.778	9.851	10.950
September	11.296	.....	9.849	.....
October	11.826	.....	10.436	.....
November	11.800	.....	10.084	.....
December	11.802	.....	10.293	.....
Year	11.296	.....	10.770	.....

New York quotations, cents per pound.

LEAD

	New York		St. Louis	
	1940	1941	1940	1941
January	5.471	5.500	5.321	5.350
February	5.076	5.602	4.926	5.452
March	5.192	5.765	5.042	5.613
April	5.071	5.850	4.921	5.700
May	5.015	5.850	4.865	5.700
June	5.000	5.850	4.850	5.700
July	5.000	5.850	4.850	5.700
August	4.854	5.850	4.704	5.700
September	4.929	.....	4.779	.....
October	5.308	.....	5.158	.....
November	5.726	.....	5.578	.....
December	5.500	.....	5.350	.....
Year	5.179	.....	5.029	.....

New York and St. Louis quotations, cents per pound.

TIN

	Straits New York		Standard, Spot London	
	1940	1941	1940	1941
January	46.707	50.154	240.716	256.648
February	45.851	51.293	242.833	264.975
March	47.079	52.067	251.711	270.131
April	46.815	51.981	252.080	269.775
May	51.570	52.166	264.098	267.534
June	54.618	52.685	273.438	262.750
July	51.591	53.481	265.592	258.272
August	51.176	52.385	262.455	257.013
September	50.348	.....	251.024	.....
October	51.490	.....	257.946	.....
November	50.577	.....	258.214	.....
December	50.101	.....	256.988	.....
Year	49.827	.....	256.425	.....

New York quotations, cents per pound. London, pounds sterling per long ton.

ZINC

	St. Louis		
	1939	1940	1941
January	4.500	5.644	7.250
February	4.500	5.534	7.250
March	4.500	5.750	7.250
April	4.500	5.750	7.250
May	4.500	5.803	7.250
June	4.500	6.235	7.250
July	4.516	6.250	7.250
August	4.719	6.389	7.250
September	6.104	6.920	.....
October	6.500	7.250	.....
November	6.500	7.250	.....
December	5.980	7.250	.....
Year	5.110	6.335	.....

St. Louis quotations, Prime Western, cents per pound

CADMIUM AND ALUMINUM

	Cadmium		Aluminum	
	1940 (a)	1941 (a)	1940	1941
January	79.038	80.000	20.000	17.000
February	80.000	82.273	20.000	17.000
March	80.000	89.038	19.769	17.000
April	80.000	90.000	19.000	17.000
May	80.000	90.000	19.000	17.000
June	80.000	90.000	19.000	17.000
July	80.000	90.000	19.000	17.000
August	80.000	90.000	18.000	17.000
September	80.000	.....	18.000	.....
October	80.000	.....	18.000	.....
November	80.000	.....	17.522	.....
December	80.000	.....	17.000	.....
Year	79.920	.....	18.691	.....

Aluminum in cents per pound, 99 plus per cent grade. Cadmium, cents per pound. (a) Producers' price, commercial sticks.

ANTIMONY, QUICKSILVER, AND PLATINUM

	Antimony (a) New York		Quicksilver (b) New York		Platinum (c) New York	
	1940	1941	1940	1941	1940	1941
January	14.000	14.000	156.962	165.846	40.000	36.000
February	14.000	14.000	178.000	170.182	40.000	36.000
March	14.000	14.000	180.921	177.692	40.000	36.000
April	14.000	14.000	173.538	180.077	38.923	36.000
May	14.0 (0	14.000	181.538	180.000	38.000	36.000
June	14.000	14.000	197.360	183.920	38.000	36.000
July	14.000	14.000	194.423	188.577	38.000	36.000
August	14.000	14.000	184.111	192.000	38.000	36.000
September	14.000	.....	173.333	.....	36.167	.....
October	14.000	.....	168.846	.....	36.000	.....
November	14.000	.....	168.391	.....	36.000	.....
December	14.000	.....	164.960	.....	36.000	.....
Year	14.000	.....	176.865	.....	37.924	.....

(a) Antimony, cents per pound, ordinary brands, in cases; in bulk f.o.b. Laredo, Tex., 13.000 for August. (b) Quicksilver, dollars per flask of 76 lb. (c) Platinum, per ounce troy.

PIG IRON

	Bessemer		Basic		No. 2 Foundry	
	1940	1941	1940	1941	1940	1941
January	23.50	24.50	22.50	23.50	23.00	24.00
February	23.50	24.50	22.50	23.50	23.00	24.00
March	23.50	24.50	22.50	23.50	23.00	24.00
April	23.50	24.50	22.50	23.50	23.00	24.00
May	23.50	24.50	22.50	23.50	23.00	24.00
June	23.50	24.50	22.50	23.50	23.00	24.00
July	23.50	24.50	22.50	23.50	23.00	24.00
August	23.50	24.50	22.50	23.50	23.00	24.00
September	23.50	.....	22.50	.....	23.00	.....
October	23.50	.....	22.50	.....	23.00	.....
November	23.50	.....	22.50	.....	23.00	.....
December	23.50	.....	22.50	.....	23.00	.....
Year	23.500	.....	22.500	.....	23.000	.....

Iron, dollars per long ton. F.o.b. Mahoning and Chenango Valley furnaces

USEFUL OPERATING IDEAS

Hard-Tempered Steel Used in Trommel

LOW-COST MAINTENANCE was a consideration kept constantly in the foreground by the management of the Victory Fluorspar Mining Co., Elizabethtown, Ill., when in 1935 a new mill was built at the Addison shaft. A trommel washing screen for the 6-in. crude ore was fitted with abrasion-resisting steel, with the result that appreciable wear has not yet become apparent.

A hard-tempered grade of Bethlehem ½-in. plate was used in making the washing barrel and screen. An annulus 4 in. high between the washing barrel and screen, also a series of ½x2-in. longitudinal lifting bars spaced 1 ft. apart circumferentially in the washing end, are made of the same material. The unit is 4x10 ft. and operates at 10 r.p.m. Screen holes are 1 in. on the inside and tapered to a slightly larger diameter on the outside.

Water is introduced with the feed and also through sprays in the screening section. The pipe supplying these sprays enters through a hollow stub driving shaft at the lower end. The upper end has a trunnion support and bearing. Slope of the cylinder is 1½ in. per foot. The object of the 4-in. annulus is to dam the material and further the scouring action in the washing end.

Trommel washer lined with hard-tempered steel

Mine Locomotive Safeguards

Paul C. Ziemke
Milwaukee, Wisconsin

ACCIDENTS caused by haulage equipment can be greatly reduced in number and severity by giving the matter a little close attention and study, as such accidents don't just happen but, to put it bluntly, are committed if not by an act of commission then surely by omission.

Naturally, when electric haulage was first introduced its peculiar hazards were unknown to the operating crew and the maintenance staff, and thus they learned through bitter experience the things and conditions that fill hospital beds and sometimes graves. Thus by a process of evolution, as it were, the clangy, noisy, and ineffective gong gave way to the more melodious and far-sounding chime bell, the clear, strong notes of which could be heard above the chatter of drill and power shovel.

Then a few bad arcs that blinded and seared the motorman taught the lesson of providing additional insulation for the lower end of the trolley pole's cable by using the simple expedient of passing it through a 6-ft. length of rubber hose, thereby easily increasing the useful life of the cable and safeguarding the motorman.

Later the wear and abuse suffered by the formed leads entering the controller resulted in the building of a welded sheet-metal guard and bolting it to the back of the controller, thus still further eliminating a potential hazard of short circuits and blinding arcs. It also served well to deflect the troublesome drips from overhead chutes and seepage from getting into the formed leads and controller as well.

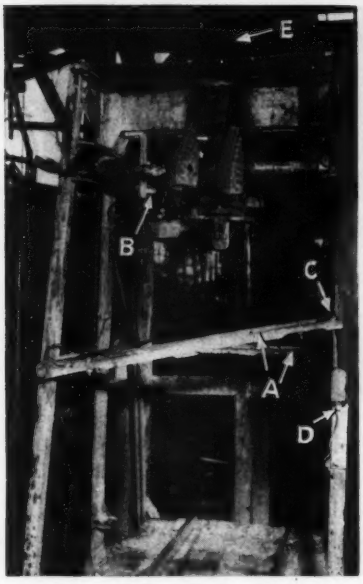
For the really wet drifts the guard was extended over the controller itself to prevent water getting into the controller by way of the drum-shaft openings in the cover plate. A round edge was provided for this larger guard by cutting a slot in one side of a length of ½-in. pipe with a shaper. This, when cut to proper size, was welded to the forward edge of the guard, facing the motorman, so that should he be thrown against it, as in derailment or by striking a curve too sharply, he would not be cut or bruised.

For the safety and convenience of the "swamper" or "nipper," a hand grip is fashioned from a section of 1-in. cold-rolled stock and bolted to the locomotive's rear top section.

The ensemble is complete when the motorman dons his shatterproof goggles, ground to prescription if he needs sight correction, and his hard-boiled hat.

Cage Signal, Overwind Stop, and Bell Contribute to Hoisting Safety

AN ELECTRICAL interlocking signal is one of several safety features of the hoisting equipment at Carlos and Addison shafts of the Victory Fluorspar Mining Co., Elizabethtown, Ill. The bars which lock the car on the cage must be down in proper position before the bell circuit is completed to allow transmission of a hoisting signal. And when men are hoisted they themselves give the signal from the cage after they have boarded it and put down the railing arms, thus eliminating the possibility of the cage starting with a man part way on.



Bars "A" hold the car on the cage and serve as railings for man hoisting. For the photographing the nearer one was blocked a few inches above the latch to show the signal contact

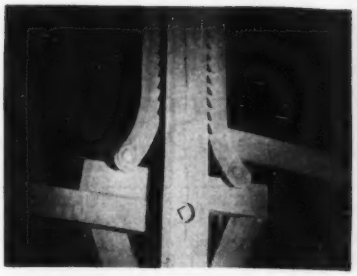
In the above the arrows "A" point to the two arms which are pivoted at the left-hand side of the cage. "B" is the pushbutton by which signals are communicated to the hoist operator in the engine room on the surface. "C" and "D" are insulated studs carrying at their other ends the contacts which come together when the arm is properly down in place. These contacts are in series with a similar pair of contacts on the arm at the other end of the cage. Electrical connection with the moving cage is maintained by a loop of twin-conductor No. 14 Amerclad Type S wire. The signal button carried on the cage comes handy also for shaft maintenance work.

Hoisting is by steam and the overwind protection consists of a mechanical arrangement to snap the throttle closed. The motion is transmitted by a direct run of steel wire from headframe to the engine room. One end of the wire is attached to the sliding box on a shaft guide 10 ft. from the top of the headframe (Fig. 2). If the cage is pulled farther than the safe limit the box is pushed up and the communication wire consequently is pulled that amount. Referring to Fig. 3,

Fig. 2. In case of overwind the cage would raise the box which encircles the guide

in the large photograph below, which shows the engineer's hand holding the throttle open against the force of the short spring "A," if the communication wire "B" is pulled it takes pin "C" with it and releases a ring which by a wire link is tied to another lever "D" on the same throttle stem. Pulling of the pin puts into action spring "E," which had been locked in tension, and it jerks the throttle closed, right out of the engineer's hand.

If by chance an overwind does occur at such speed that the cage should hit the top and break the rope or dislodge the sheave in spite of the automatic closing of the throttle, the automatic jaws located at the very top of the headframe guide will catch the cage. Heavy tension springs (up beyond the range of the view) hold the jaws together at the top. That safety device does not mean that the cage is without the conventional automatic safety dogs. It has those, and the cross shaft and mechanism for their operation can be seen in the large photo.



These jaws flanking the guide would catch the cage in that extreme case of an overwind resulting in a broken rope or dislodged sheave

Still another safety device is a bell which is attached to the top end of a piece of spring wire ("E" cage photo) projecting about 2 ft. above the cage. Slight vibration of the cage sets the bell to swinging and thus it rings continuously during a hoist to warn men below or to warn maintenance men who may be working in the pipe compartment. At Addison shaft at the company's mill, 600 ft. away, this vibration type of warning bell is used on top of the counterweight as well as on the cage.

Martin Schwerin, president of the Victory Fluorspar Mining Co., was the designer of these shaft-hoisting safety devices.

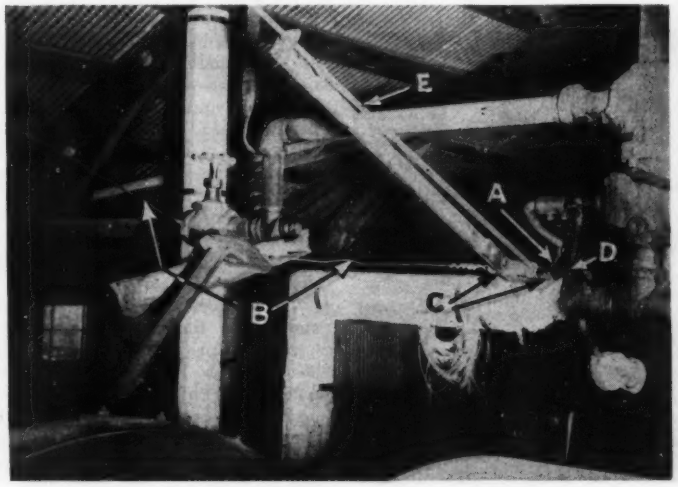


Fig. 3. Spring "E" is in tension and when released will jerk the throttle closed, out of the engineer's hand

Signal Rings Mounted On Mine Hangers

DEPENDENCY is a requisite of all hoisting equipment, and signaling function is no exception. The problem of installing signal circuit collector rings on the 14-in. shaft of a hoist so the rings would "forever" be mechanically secure and yet insulated permanently from the shaft was resolved to simplicity by use of a standard commercial insulator built for a different purpose.

Shop-made collector rings ready for installing on the drum shaft of the hoist

By request, A. W. Hodgins, of Mullan, Idaho, chief electrician in charge of electrical maintenance and installation for the Federal Mining & Smelting Co., has furnished a brief description of the job. The hoist, serving a deep shaft of the Federal company, is a Nordberg 350-hp. electric with single-reel flat-rope drum on which 3,450 ft. of the flat rope is used. Inclosed in this rope are signal wires over which 110-volt a.c. power is transmitted for signaling to and from the hoistman and the hoist deck of the cage.

The accompanying photograph shows the two collector rings standing side by side and each assembled with four spool insulators ready for installing on the 14-in. shaft. These insulators are of the Dirago quality made by the Ohio Brass Co. for use in standard mine hangers. The style used is the Catalogue No. 16835 with a $\frac{5}{8}$-in. tap in the top and a $\frac{5}{8}$-in. stud on the bottom.

Insulator attachment to the collector rings is by screwing the stud ends into holes tapped into the rings. Screwed into the other end of the insulators are threaded, pointed, and hardened studs fitted with lock nuts. Each ring—thickness $1\frac{1}{8}$-in., width $1\frac{1}{2}$ in.—is made in two pieces with lapped joints, each held together by two capscrews. Installation was a simple job. After the two halves were assembled around the shaft the pointed and hardened studs were turned and locked to secure and centralize the ring.

Ore-Bin Truck Ramp

IMPROVEMENTS at the Victory Fluorspar Mining Co.'s property, Elizabethtown, Ill., include a motor truck ramp in the design of which Lenher Schwerin, general manager, exercised the same care, looking to efficiency, safety, and low maintenance, as is evident in equipment of the mill and mine. Although built with a minimum of materials, without a floor along the center and with narrow runways for the tires, trucks can back onto the ramp at fair speed without risk of going over the side.

This ramp was built in connection with a new mill at Addison shaft. This mill also works ore from Carlos shaft, 1,100 ft. away, and it is from that shaft that a 5-ton motor truck hauls the ore which is dumped in a bin at the top of the ramp.

Built on a favorably sloping hillside, the ramp is 120 ft. long and mounts on a grade of 2 in. per foot ($16\frac{2}{3}$ percent). Guide rails 8 in. high are curved at the top to present a surface impossible for a tire to climb. The whole contact face of these rails is covered with curved sheet steel with countersunk bolt heads.

All of the wood of the trestle is creosoted and the same treatment is given all other wooden structures of the company. That care in preservation is typical of the plant management. Paint and grease are used generously to prevent rusting of equipment and during the regular winter shutdowns of the plant the steel mine cars are brought to the surface and the whole bodies heavily greased.

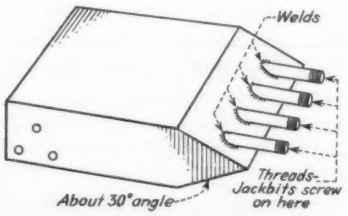
Five Dollars Easily Earned

HOW MANY TIMES have you ironed out a kink in electrical maintenance practices? How many times have you studied an operating problem and licked it, to the satisfaction of yourself and your boss? *E.&M.J.* pays a five dollar minimum for all operating ideas accepted for publication. Just sketch it, or photograph it, and describe it in sufficient detail to give the complete idea then send it in. Our readers want them and we gladly pay the price for them. May we have your "Idea" now?

Motor truck ramp to top of crude ore bin. Curved steel plates on the guard rails are a safety feature and prevent wear on side walls of tires

Replaceable Wearing Parts For Ball Mill Scoop Lip

TO RETARD THE WEAR on the ball mill scoop lip, Verne Haas, master mechanic of Desert Silver, Inc., Nivloc, Nev., designed and applied the idea shown in accompanying cut.



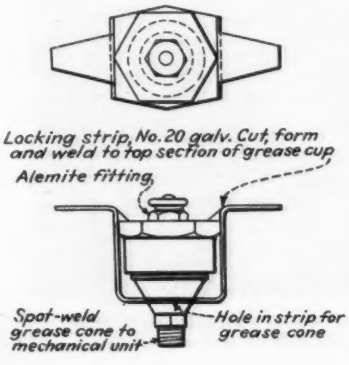
To an ordinary ball-mill scoop lip four pieces of round drifter steel 3 in. long were welded on the back of the lip at about a 30-deg. angle, with the drifter steel threads pointing outward. Discarded jackbits were then screwed on the ends of the drifter steel to take the wear. The scrap pile furnished plenty of old jackbits, which last five or six days. Bits can be changed in about three minutes and the lip now lasts from six to eight months, as against two to three weeks' life before the drifter steel pieces were used to take the wear.

▼ ▼ ▼

Theft-Proof Grease Cup

THE incomprehensible mental processes of the light-fingered gentry who persist in purloining grease cups from exposed machinery have been effectually blocked by the locking strip shown in the accompanying sketch, writes Elwood Stockman, of Chile Exploration Co., New York City.

A hole is made at the center of the locking strip of such diameter that it contacts the cone of the grease cup at about half its height. The cone is inserted in the hole and the cup turned down onto it about two threads, after which the strip is spot-welded to the cup, as shown. Thus, the cup is free to turn on the cone, but cannot be removed from it.


Locking strip, No. 20 galv. Cut, form and weld to top section of grease cup
Alemite fitting
Spot-weld grease cone to mechanical unit
Hole in strip for grease cone

An Alemite lubrication fitting is applied to the cup for forced charging. Finally, the base of the cone is spot-welded to the mechanical unit it feeds.

The outline of the locking strip is representative of several types which have been developed by the operating department of the Chile Exploration Co., at Chuquicamata, Chile.

▼ ▼ ▼

Handy Flow Indicator

THERE ARE OCCASIONS when the water supply at a mine power house is limited, or high priced if purchased. Usually a cooling tower helps solve the problem for air compressors and such machinery, while in some instances the coolant is required to remain under pressure as it passes through the equipment.

In such circumstances no opening to atmosphere is possible and the operator must resort to some visual means of determining when water in sufficient quantities is flowing. Opening supply valves and checking thermometers, of course, is a means of noting coolant flow, but P. C. Ziemke, Milwaukee, Wis., offers still another common device that will serve well to indicate visually the quantity and even the turbidity of water supplied the mechanism.

Offered by the gasoline vending trade, which uses it to indicate the flow of motor fuel through service pumps, the flow glass, as it is called, is tested for 60-lb. pressure, which is ordinarily sufficient for most installations. The use of the glass indicator, equipped with a light behind for night operation, always informs the operator of the presence or lack of water in the same manner as the operator would observe the flow discharging into an open-type drain-off.

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Waffle-Iron Rolls For Fluorspar Grinding

NEW CRUSHING EQUIPMENT at the mill of the Victory Fluorspar Mining Co., Elizabethtown, Ill., includes a type of crushing roll which, according to Lenher Schwerin, general manager, represents an advanced practice in the milling of fluorspar. Specifically this is the use of waffle-iron surfaces on the crushing rolls which reduce ore from 2-in. to 1-in. size for jig concentration.

Primary crushing is done with this 18x18-in. unit

Both the waffle-iron roll unit and a primary crusher were purchased from McLanahan & Stone Corporation. The primary has a single 18x18-in. roll reducing to 2-in. the ore which passed through a 6-in. grizzly and over the 1-in. screen of a trommel washer. Feed to the rolls is the crushed product from the single-roll crusher. White cast iron is the material constituting the waffle surfaces of the rolls.

These crushing rolls have white-cast-iron surfaces of the waffle-iron type

E.&M.J. pays a five dollar minimum for all operating ideas accepted for publication. Just sketch it, or photograph it, and describe it in sufficient detail to give the complete idea, then send it in. Our readers want them and we gladly pay the price for them.

PERSONAL ITEMS

Hans Lundberg visited British Columbia in July on professional work.

C. St. Clair Parsons, A.R.S.M., A.I.M.E., formerly of London, England, has opened offices in Vancouver.

Victor Dolmage, prominent Vancouver geologist, is engaged in a consulting capacity with Wright-Hargreaves in Ontario.

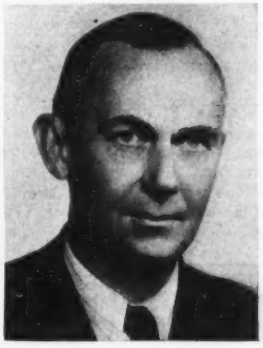
Earle M. Bagley, metallurgist, of Los Gatos, Calif., has joined the staff of Mammoth-St. Anthony, Ltd., Tiger, Ariz.

Leon W. Dupuy, mining engineer, Los Angeles, Calif., is in charge of the Ima tungsten project, Patterson, Idaho, where diamond drilling is under way.

Frank X. Banz, superintendent of the smelting division of Chile Exploration Co., at Chuquicamata, Chile, is returning to the United States, where his address will be 2806 Southern Ave., Baltimore, Md.

Stanley O. Reichert, formerly geologist for the Bertha Minerals Division, New Jersey Zinc Co., is assistant geologist for Tennessee Coal, Iron & Railway Co., Birmingham, Ala.

John S. Stewart, for four years consulting metallurgical engineer on the design and operation of the new lead smelter and refinery built by Trepca



JOHN S. STEWART

Mines, Ltd., at Zvecan, Yugoslavia, arrived in New York on the S.S. "Excalibur" on Aug. 25. His mailing address for the present is, care of Chase National Bank, 25 Broadway, New York.

Clarence Woods, president, Inca Mining & Development Co., Tirapata, Peru, is in the United States for an extended stay, accompanied by Mrs. Woods. He can be reached at Box 762, Balboa Island, Calif.

Rowe McCrae, formerly mill superintendent for Cia. Unificada, Potosi, Bolivia, has returned to the United States and can be reached at 501 Cedar St., Rolla, Mo.

T. S. McKay, who recently returned from British Guiana, has left for Eastern Canada to commence training in the Royal Canadian Air Force.

George T. Scholey, general manager of Nielson & Co., Inc., recently returned to Seattle after conferring with Henry F. Grady, of the Metals Reserve Co. Nielson & Co., Inc., is the major cop-

GEORGE T. SCHOLEY

per producer in the Philippines and the main topic of discussion was the shipping of copper ores and matte to the United States. Shipping of chromite and manganese ores, of which the Philippines contain large deposits, was also discussed. Mr. Grady left for the Philippines by Clipper on Aug. 12, and Mr. Scholey on Aug. 23 for the same destination.

Franklyn W. Hedges, formerly at the Itogon mine, in Baguio, P. I., for Marsman & Co., is now connected with the U. S. Army Engineers in a civilian capacity.

Colonel Charles F. Williams, District Mining Supervisor of the U. S. Geological Survey, stationed at Miami, Okla., is now on active duty as Corps Chemical Officer in the Second Army of Arkansas.

Victor J. Pimentel and **R. W. Prince,** engineer graduates of the Mackay School of Mines, recently completed investigation and appraisal of mining claims lying within the 50x100-mile Tonopah bombing range of the Army air service.

E. J. Belleau, formerly associated with the A. M. Elizalde interests in the Philippines, is reopening the old Nevada Eagles mine, near Goldfield, Nev., acquired lately by Elizalde, who has built a home near Carrara, southern Nye County, Nev., where he is head of the Carrara Portland Cement Co.

Adam L. Wesner has joined the technical staff of Battelle Memorial Institute, at Columbus, Ohio. He has been assigned to the division of materials

ADAM L. WESNER

beneficiation, where investigations of ore-dressing methods are in progress. Prior to joining Battelle, Mr. Wesner was associated with the U. S. Bureau of Mines at Rolla, Mo.

Ing. Gustavo Serrano, who has held several important public posts, including that of Minister of Communications and Public Works, is the new president of the Mining Association of Mexico, Gante, No. 15, Mexico City. He succeeds **Ing. Javier Sanchez Mejorada,** who died recently.

Philip D. Wilson, vice president of Pardners Mines Corp., 405 Lexington Ave., New York, who recently returned from Cuba, where he has been directing the development of the several nickel properties of the Nicaro Nickel Co. during the past three years, has just completed a preliminary survey and estimate of the ore reserves and the potential production of bauxite ore in the Arkansas field for the OPM bauxite and alumina unit, of which he is a member.

Elmer W. Pehrson has been appointed chief of the economics and statistics branch of the United States Bureau of Mines. Mr. Pehrson, a mining engineer

ELMER W. PEHRSON

and economist, has been acting head of the economics and statistics branch since the retirement of **James W. Furness** in May, 1940. Under Mr. Pehrson's supervision, the Bureau is collecting and

supplying monthly data on production, consumption, and stocks of strategic and critical minerals and other important defense materials.

Dr. Curtis L. Wilson, for the past twenty years connected with the Montana School of Mines at Butte, Montana, and for the last thirteen years professor of metallurgy and head of the metallurgy department there, has been appointed dean of the Missouri School of Mines and Metallurgy at Rolla, Mo., succeeding **Dr. William R. Chedsey,** resigned. Dean Wilson assumed his new duties at Rolla on Aug. 1. Dean Wilson was born and reared in Baltimore, Maryland, graduating from the Baltimore City College there in 1916, after which he moved to Montana and graduated from the Montana School of Mines in 1920. After working for a year with the Anaconda Copper company, at Butte, in various capacities, Dr. Wilson joined the faculty of the Montana School of Mines as instructor, and was later promoted to the head of the metallurgy department.

DR. CURTIS L. WILSON

Donald Hamilton McLaughlin has succeeded the late Frank H. Probert as dean of the College of Mining at the University of California. Dean McLaughlin comes to the University with a distinguished record as geologist, writer, consulting mining engineer, and educator, his most recent post having been that of chairman of the department of geology at Harvard.

S. Power Warren has completed his work for the Nevada-Massachusetts Co., for which he supervised construction, and carried through the starting period to the successful operation, of its chemical plant at Golconda, Nev. This plant treats tungsten ore from the company's nearby mine by a combined pyro- and hydro-metallurgical process which produces a final product of chemically precipitated calcium tungstate. After a brief vacation Mr. Warren will become associated with the United States Vanadium Corp. and for the present may be reached at P. O. Box 953, Uravan, Colo.

Jay L. Hench, who has been vice president of the Hillside Fluor Spar Mines since 1922, has been elected president and treasurer, to succeed George H. Jones, who died on July 6 last. Mr. Hench also succeeds Mr. Jones as president and treasurer of the Mid-West Forging & Mfg. Co., of which company he has been vice president since 1924.

OBITUARY

Karl Eilers, a former vice president of the American Smelting & Refining Co., died at Sea Cliff, Long Island, on Aug. 18, after an illness of several months. He was 75 years old. Mr. Eilers was born in Marietta, Ohio, and was graduated from the Polytechnic Institute, in Brooklyn, in 1884 and from Columbia School of Mines in 1889. During the next four years he worked as an assayer for several Western mining companies and for another four years he was superintendent of the Colorado Smelting Co. at Pueblo, Colo. From 1899 to 1920 he was with the American Smelting & Refining Co., since the latter date as a consultant. He was vice president of the A.I.M.E. in 1916 and 1917. In 1934 Mr. Eilers accepted the presidency of the Associated Hospital Service of New York. During the period of his presidency the organization grew until in March, 1938, more than 650,000 had been enrolled in the metropolitan area. For the last 16 years Mr. Eilers had been president, also, of Lenox Hill Hospital, in New York. He leaves a widow, the former Leonie Wurlitzer, of Cincinnati, and three children: Mrs. Marguerite Eilers Beer, and K. Fritz and F. Farny Eilers.

KARL EILERS

Major George W. Farny, of Morris Plains, N. J., a consulting mining and civil engineer known especially for his services in Russia, died at the home of Mrs. Karl Eilers, his sister-in-law, at Sea Cliff, Long Island, on Sept. 1. He was 69 years old. Major Farny was a graduate of the Michigan College of Mines, at Houghton, Mich. In addition to important construction work in Russia, he prepared for the Turkish Government a report on a national system of highways. He had long been a leader in civic planning projects for the State of New Jersey.

Pavel Stepanovich Nazaroff, consulting mining engineer of Johannesburg, South Africa, died recently in that city. He was 65.

August F. Sowell, 68, former operator of a manganese mining concern at Batesville, Ark., died Aug. 10 at Columbia, Tenn.

Pascual Baburizza, long prominently identified with the nitrate industry in Chile, died recently at Santiago, at the age of 66.

Horace A. Staples, vice president in charge of engineering, Phelps Dodge Copper Products Corp., died at Plainfield, N. J., on Aug. 25. He was 61 years old.

Prof. W. N. Logan, former State Geologist of Indiana and former professor of geology at Indiana University, died on Aug. 27 at Bloomington, Ind., at the age of 71.

Homer S. Snow, vice president and traffic manager of the American Zinc, Lead & Smelting Co., died on Aug. 9 in St. Louis at the age of 69. He had been associated with the company since 1914.

Louis R. Davidson, retired industrialist, who organized the Davidson Ore Mining Co. in 1910, which company owned and operated iron-ore mines in Michigan, died in Buffalo on Aug. 28. He was 75 years old.

Dr. William S. Dwyer, geologist, mining engineer, and consultant, formerly with the Geological Survey of Canada and the Ontario Department of Mines and chief engineer of O'Brien Gold Mines, died in Toronto on June 4 last. His age was 47.

Analyzing Results of Mining Enterprises

A Correction

IN MR. FAGERBERG'S PAPER on this subject, published in our issue for July, 1941, several typographical errors were made, which are corrected herewith.

Page 45, two-column measure, item No. 3, second line: for "19.87107¢ per ton," please read "19.78107¢ per ton."

Page 48, first column, fourth paragraph from bottom: for "effecting this" read "offsetting this."

Page 48, two-column table, substitute the accompanying table with correct plus and minus signs.

Profit Factor	This Period	Prior Period	+Increase —Decrease	Times Multiplying Factor	Profit +Increase or —Decrease
Tonnage	18,706	17,290	+1,416	$4.5639531	+$6,462.56
Millheads ...	$4.3661424	$4.5639531	—$0.1978107	18,706	—3,700.25
A. Net revenue variation (increase)					+$2,762.31
Tonnage	18,706	17.290	+1,416	$3.3784193	—$4,783.84
Per-Ton Cost	$3.2708708	$3.3784193	—$0.1075485	18,706	+2,011.80
B. Net expense variation (increase)					—$2,772.04
Net decrease in operating profit					—$9.73

NEW BOOKS

THE ENGINEERING PROFESSION. *By Theodore Jesse Hoover and John Charles Lounsberry Fish. Stanford University Press, Stanford University, Calif. Pages 439. Price $5.*

YOUNG MEN who think they would like to become engineers and who first want to know something about the engineering profession are the ones for whom this book has been prepared by the authors, both of whom have practiced and taught mining and civil engineering. Supplementing their own experience, Messrs. Hoover and Fish have drawn upon some 52 other engineers, whose names they list, for data and counsel in the effort to describe the duties and qualifications of the professional engineer and his habit of mind. The book is not technical, aside from occasional references. After explaining who is an engineer and defining engineering, the authors discuss the five principal branches of the profession—namely, civil, mining, mechanical, electrical, and chemical engineering. In each case they describe the nature and character of the field, the functions of the engineer engaged in it, and the practical details of his job, including the prospective remuneration. The rest of the book deals with the engineering method and its application, the uncertainties in engineering, vocational guidance, and education. Surely the young man of today who would enter engineering need not err through lack of competent advice.

THE NEW ENCYCLOPEDIA OF MACHINE SHOP PRACTICE. *Edited by George W. Barnwell, Professor of Production Practice, Stevens Institute of Technology. Published by William H. Wise & Co., Inc., New York. Pages 561. Price $1.98, in textile leather; $2.48 in fabrikoid with thumb-notched index.*

SIXTEEN CHAPTERS on as many subjects and by ten authors compose this book. John Wayne and Dennis Laycock have prepared the chapter on bench work; John D. Watson the chapters on metals in engineering production, heat-treatment of metals, and forging, respectively, and, in collaboration with Eric N. Simons, the one on welding, soldering, and brazing. Mr. Simons also deals with milling and grinding and with special machine tools in separate chapters. H. C. Towne is the author of chapters on the lathe, on thread-cutting, and on taper-turning, knurling, and other uses of the lathe. W. A. Tuplin has covered gears and gear-cutting; J. S. Murphy jigs and fixtures, as well as pressing, stamping, and punching; E. D. Howard foundry work; Ronald Smith measuring and testing; and J. W. Broadvent machine drawing. The book is profusely illustrated with several hundred sketches and drawings, these taking the place of photographs. A cheap grade of paper has been used, in keeping with the low price of the book.

THE MANUSCRIPT. *A guide for its preparation. Published by John Wiley & Sons, Inc., New York City. Third editor; 6 by 9 in. Pp. 75. Price $1.*

PRACTICAL DIRECTION for editors, copy readers, desk men, and printshop white-collar folks concerning the highly technical methods of procedure which must be carefully observed to attain economy and efficiency in the production of books, magazines, and related forms of printing. The volume provides the answers to the production problems of publishing—aside from those mechanical in character—and is a helpful reference work in preparing copy for the printer, handling proof, shipping and mailing proofs, and formal publication and copyright. An adequate glossary and index contribute to the working value of the book, which contains much more reference and guide material than its modest title suggests.

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PUBLICATIONS

RECEIVED

"Mechanism." By Stanton E. Winston. This book deals with the fundamental theory of the modification and transmission of motion. Published by American Technical Society, Drexel Ave. and 58th St., Chicago. Pp. 372.

"Farming Out Methods." A bulletin on the importance of subcontracting defense contracts, and procedures adopted in the farming out process. Labor Division, Office of Production Management, Washington, D. C.

"Handbook of Industrial Fabrics." By George B. Haven, Wellington Sears Company, New York. Pp. 789.

The Mint. Annual report of the Director for the fiscal year ended June 30, 1940, including report on the production of the precious metals for the calendar year 1939. Superintendent of Documents, Washington, D. C. Price 15c.

Fire Protection. Crosby-Fiske-Forster Handbook: Robert S. Moulton, general editor. National Fire Protection Assn., 60 Batterymarch St., Boston, Mass. Price $4.50. Ninth edition, fully revised, with much new material, including a chapter on mine fires and explosions.

Directory of Association of Consulting Chemists and Chemical Engineers, Inc., 50 East 41st St., New York, N. Y. Sixth edition, Jan. 1, 1941. Lists members alphabetically and geographically, and gives qualifications and types of work handled.

Mining Engineering. By Charles E. Locke, professor of mining engineering and ore dressing, Massachusetts Institute of Technology. Bellman Publishing Co., Inc., 6 Park St., Boston, Mass. Pp. 28. Price 50c. This monograph covers personal qualifications required for engaging in the work; scholastic training; employment opportunities; remuneration and opportunities.

Diamond Core Drill Fittings (Third Edition). Commercial Standard CS17-42. National Bureau of Standards, Washington, D. C. Pp. 20. Price 10c.

Public Health Service Bulletin 259. Industrial hygiene programs for mines and factories. For sale by Superintendent of Documents, Washington, D. C. Price 20c.

Tennessee. Preliminary Directory of Mineral and Chemical Industries in Tennessee. By George I. Whitlatch. Markets Circular No. 11. Issued by Division of Geology, Nashville, Tenn. Pp. 31.

Vermont. Report of State Geologist 1939–40. Summary of Mineral Industries.

Clays and Shales of Washington. By Sheldon L. Glover. Bulletin No. 24. Department of Conservation and Development, Olympia, Wash. Pp. 368. Price $1.

An Investigation as to the Presence of Commercial Quantities of Mercury and Gold in the Dry Lakes of Nevada. By Jay A. Carpenter, Geology and Mining Series No. 35. Bulletin of University of Nevada, Reno, Nev. Pp. 20. Price, 25c.

Ontario. Forty-ninth Annual Report of the Ontario Department of Mines, Toronto. Pp. 295. This presents a statistical review of the industry in the provinces for 1939, a list of mines, quarries, and works, and, occupying the larger part of the book, some 170 pages on the operations of the individual companies.

British Guiana. Geology and Mineral Deposits of the Upper Waini River, North West District. Geological Survey of British Guiana, Georgetown, Demerara. Price 24c.

Nova Scotia. Annual Report on Mines, 1940. L. D. Currie, Minister of Mines, Halifax, N. S.

South Australia. Annual Report of the Director of Mines and Government Geologist, 1939. L. Keith Ward, Director, Adelaide, Australia.

South Australia. Mining Review for half year ended June 30, 1940. Department of Mines, Adelaide. Pp. 95.

Yilgarn Goldfield. The Mining Groups of the Yilgarn Goldfield, South of Great Eastern Railway: Part I, From Southern Cross Southwards to Marvel Loch. By R. S. Matheson and R. A. Hobson. Bulletin 98, Geological Survey of Western Australia, Perth. Pp. 165, with 10 drawings and a separate atlas of 24 plates of maps, plans and sections.

Western Australia. Annual Progress Report for 1939. Geological Survey, Perth. Pp. 55, plus maps.

Stoping Methods and Costs in the Gold Mines of the Baguio District, Mountain Province, Philippines. By W. F. Boericke and Nestorio N. Lim. Information Circular No. 4, Bureau of Mines, Manila, P. I. Pp. 42.

U. S. Geological Survey has issued the following (for sale by Superintendent of Documents, Washington, D. C., at stated price):

"Geology of Area Between Green and Grand Rivers, Grand and San Juan Counties, Utah." Bulletin 908. Pp. 107, plus separate maps. Price $1.50.

"Ore Deposits in the Vicinity of the London Fault of Colorado." Bulletin 911. Pp. 74, plus separate maps. Price $1.50.

Bureau of Mines, Washington, D. C., has issued the following (no charge is made):

"Ore Testing Studies (Primarily Precious Metals)." R. I. 3569.

"Mineral Physics Studies (Ferromagnetic Properties of Hematite." R. I. 3570.

"Carbonaceous Cation and Anion Exchangers in Water Treatment." R. I. 3571.

R. I. 3553. Progress Reports—Metallurgical Division. "Cationic Reagents in the Flotation of Silica from Gypsum Ores." By J. Bruce Clemmer and F. D. DeVaney.

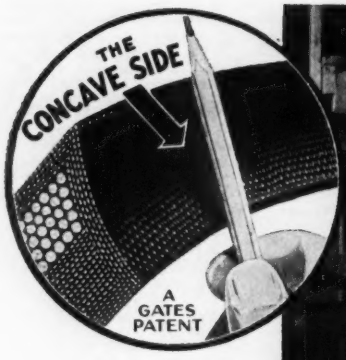
R. I. 3569. Progress Reports—Metallurgical Division. Microscopic Studies. "Physical Characteristics of Some Low-Grade Manganese Ores." By R. E. Head.

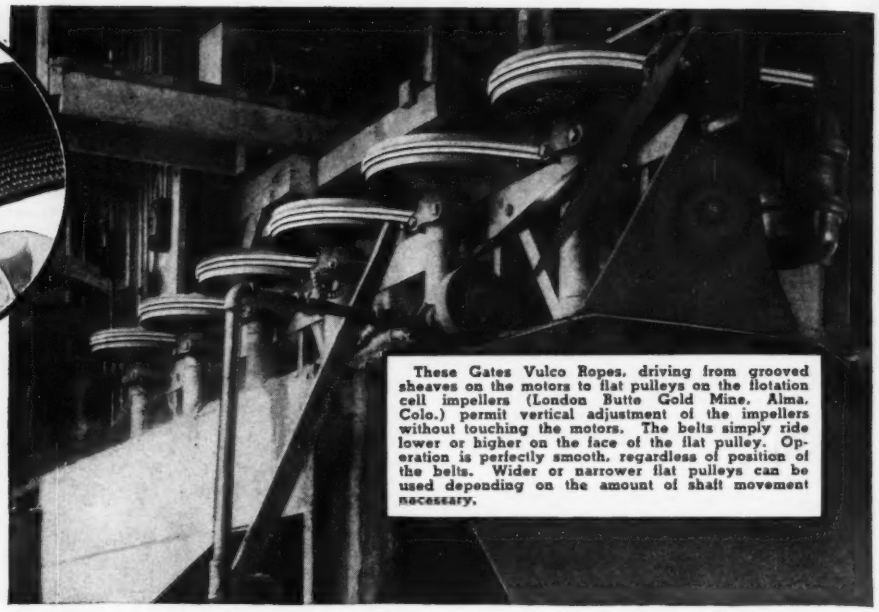
I. C. 7148. "Dust-explosion Hazards in Plants Producing or Handling Aluminum, Magnesium, or Zinc Powder." By Hylon R. Brown.

I. C. 7149. "Marketing of Barite." By Bertrand L. Johnson.

I. C. 7152. "Methods and Costs of Mining Zinc-Lead Ores at the Pend Oreille Mines and Metals Co., Metaline Falls, Wash." By Charles A. R. Lambly.

I. C. 7154. Strategic Minerals Investigations. Progress Report on Exploration of Tin Deposits. By Mining Division, Bureau of Mines.





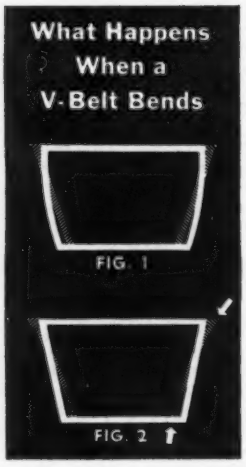
These Gates Vulco Ropes, driving from grooved sheaves on the motors to flat pulleys on the flotation cell impellers (London Butte Gold Mine, Alma, Colo.) permit vertical adjustment of the impellers without touching the motors. The belts simply ride lower or higher on the face of the flat pulley. Operation is perfectly smooth, regardless of position of the belts. Wider or narrower flat pulleys can be used depending on the amount of shaft movement necessary.

This Simple Test Shows Exactly Why

The Patented

CONCAVE SIDE

substantially cuts your belt costs!



To see *for yourself* the money-saving importance of the Concave Side, simply pick up *any* V-belt you have handy and bend the belt as it bends in going around a pulley.

As the belt bends, grip its side-walls between your finger and thumb. You will feel the sides of the belt *change shape*. If the sides were straight before bending, they become *convex* as the belt bends. (See Figure 1 on the left). Note how the sides bulge *out*.

Now look at Figure 2. Here you see how bending changes the shape of a belt with the patented concave side. The side becomes perfectly straight. This belt, when bent, precisely fits the sheave groove. Two big savings result —(1) There is no side-bulge and this means uniform side-wall wear—*longer life!* (2) There is a full side-width grip on the pulley and this carries heavier loads without slippage—saving the belts and also saving your *power!*

The concave side is a Gates patent. Only belts built by Gates are built with the concave side.

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What Metal Statistics Show

ACCORDING to the Bureau of Mines, United States Department of the Interior, lead production during the first five months of this year is 190,342 tons, or an increase of 1.5 percent over the same period last year. Production in the Central States may show a decline this year, against 1940, as a relatively large decrease is indicated for Southeastern Missouri and a small increase for the Tri-State region. States that will provide increases are Idaho, Utah, Nevada, and Arizona, whereas, Montana indicates a decrease of about 4,000 tons.

Domestic mines produced 82,314 tons of copper in June, 2 percent less than in May, according to the Bureau of Mines. Daily rate of production, however, was slightly higher in June than in May. If the June rate of production is maintained for the remainder of 1941 a total output for the year of 973,000 tons is indicated, an increase of 11 percent over 1940.

▶ Because the 12c. ceiling might act to jeopardize a small part of current output, Leon Henderson is recommending that the Metals Reserve Co. purchase such high-cost copper at prices in excess of 12c. a pound.

The 12c. ceiling price applies to ordinary forms of wire and ingot bars covering electrolytic, Lake, or other fire-refined copper made to meet the American Society of Testing Materials standard for electrolytic copper.

On casting copper, 99.5 percent pure, a ceiling of 11¾c. was set.

July deliveries were large, 143,122 tons, the expanded movement to consumers reflecting, in part, nervousness about priorities. The latest domestic statistics, including foreign copper released by the Metals Reserve, in tons, follow:

Production:	June	July
Crude	(a)82,558	82,870
Refined	88,560	86,879
Deliveries, refined:		
Domestic customers	115,097	143,089
Export	42	33
Totals	115,139	143,122
Stock at end, refined	98,164	74,384

(a) Revised.

The figures indicate that, out of total shipments made in July, 32,463 tons consisted of foreign copper released by Metals Reserve Co.

▶ TUNGSTEN—Imports in May of tungsten ore entered for domestic consumption amounted to 2,743,939 lb., gross weight, valued at $1,278,948. Imports during May, in pounds, according to countries of origin, were as follows:

From:	Gross Weight	Tungsten Content
Portugal	14,353	8,116
Argentina	27,048	14,236
Bolivia	734,231	314,586
Peru	32,911	16,294
British Malaya	772	444
China	1,655,731	848,439
Thailand (Siam)	234,637	122,226
Australia	12,700	6,442
Belgian Congo	5,000	2,561
Union of S. Africa	26,556	14,336
Totals	2,743,939	1,347,680

▶ MOLYBDENUM—Exports of molybdenum ore and concentrate during May amounted to 347,135 lb., containing 172,981 lb. of Mo, valued at $119,107. Exports of molybdenum ore and concentrate during the first five months of 1941 amounted to 2,575,144 lb., containing 1,312,569 lb. of Mo, valued at $903,409.

E & M J Weighted Index of Non-Ferrous Metal Prices

(100 is composite for 1922–3–4)

1929	110.33	1935	74.66
1930	82.87	1936	73.45
1931	60.20	1937	90.86
1932	48.26	1938	73.67
1933	59.79	1939	77.71
1934	69.59	1940	79.22

	1939	1940	1941
January	77.12	80.85	82.48
February	76.89	77.23	82.76
March	77.00	77.94	83.27
April	74.79	77.19	83.48
May	73.61	77.68	83.48
June	73.17	78.85	83.51
July	71.95	76.72	83.60
August	73.88	76.71	83.39
September	83.07	79.40	....
October	84.25	82.49	....
November	83.80	83.14	....
December	82.89	82.42	....

▶ LEAD—Statistics covering lead refined in this country for the months of June and July, in tons, according to the American Bureau of Metal Statistics, follow:

	June	July
Stock at beginning	34,018	24,265
Production:		
From domestic ore	38,669	42,048
Secondary and foreign	9,555	6,941
Totals	48,224	48,989
Domestic shipments	57,969	54,067
Stock at end	24,265	19,172

▶ QUICKSILVER—Quicksilver statistics for the first six months of the current year, in flasks of 76 lb. each, follow.

	Production	Consumption	Stocks (a)
January	3,100	2,900	14,100
February	2,900	4,700	12,100
March	3,500	4,000	11,600
April	3,500	3,200	11,700
May	3,600	3,500	10,700
June	4,000	3,300	11,400

(a) Consumers' and dealers' stocks.

Exports for May amounted to 104 flasks, against 217 flasks in April. Export data for June not yet available.

Imports for domestic consumption during May were nil, against 25 flasks in April.

Revised Zinc Statistics

American Zinc Institute, Inc.

To conform to the necessities of the current situation, and commencing with the figures for August, this report will be issued monthly by the American Zinc Institute, and all other reports relating to slab-zinc production, shipments, and stocks will be discontinued.

Commencing with January, 1940, production from foreign ores is included in the monthly figures which reflect the total output at smelters of slab-zinc of all grades, as reported by all producers represented in the membership of the Institute. The unchanged totals for previous years do not include production from foreign ores, which was not a vital factor in those years.

TOTAL SLAB-ZINC SMELTER OUTPUT (ALL GRADES) 1940–1941, tons of 2000 lb.

				Shipments				Unfilled Orders	
1940	Stock at Beginning	Production	Total	Domestic	Exports & Drawback	Total	Stock End of Period	End of Period	Daily Average Prod.
January	74,262	58,442	132,704	54,291	5,535	59,826	72,878	36,808	1,885
February	72,878	55,518	128,396	50,386	3,481	53,867	74,529	47,496	1,914
March	74,529	58,890	133,419	49,163	3,633	52,796	80,623	34,580	1,900
April	80,623	57,299	137,922	45,498	4,604	50,102	87,820	45,326	1,910
May	87,820	58,320	146,140	53,557	13,526	67,083	79,057	55,389	1,881
June	79,057	53,273	132,330	52,946	3,854	56,800	75,530	59,043	1,776
July	75,530	57,168	132,698	56,064	8,627	64,691	68,007	53,726	1,844
August	68,007	57,196	125,203	59,511	13,478	72,989	52,214	69,508	1,845
September	52,214	59,800	112,014	63,045	12,148	75,193	36,821	95,445	1,993
October	36,821	63,338	100,159	63,970	9,129	73,099	27,060	116,420	2,043
November	27,060	61,502	88,562	61,200	4,864	66,064	22,498	126,120	2,050
December	22,498	65,354	87,852	64,984	5,286	70,270	17,582	125,132	2,108
		706,100		674,615	88,165	762,780			
Monthly average		58,842		56,217	7,347	63,565	Daily average		1,929
1941									
January	17,582	66,121	83,703	63,930	4,914	68,844	14,859	121,026	2,133
February	14,859	61,603	76,462	57,663	8,155	65,818	10,644	108,151	2,200
March	10,644	70,341	80,985	65,011	2,629	67,640	13,345	97,638	2,269
April	13,345	68,543	81,888	65,035	5,379	70,414	11,474	95,256	2,285
May	11,474	73,449	84,923	61,696	11,394	73,090	11,833	98,435	2,369
June	11,833	70,837	82,670	61,546	10,023	71,569	11,101	92,583	2,361
July	11,101	74,641	85,742	62,714	9,180	71,894	13,848	81,456	2,408
August	13,848	75,524	89,372	61,061	10,342	71,403	17,969	68,604	2,436

CALIFORNIA

Leagrant Quicksilver Mine Nears Production Stage

Ore will be treated in 50 ton plant—Work started on a long tunnel at Zeibright Mine

▶ Production is scheduled to be started soon at the Leagrant quicksilver mine, in Panoche Valley, San Benito County, where a 50-ton Gould treatment plant has been installed. The mine has been under development for the past year, and 15 men are employed under the direction of E. H. L. Mitchell, general manager. Owners and operators are Spencer Grant, of San Francisco, and Col. R. W. Lea, of New York City.

▶ Work has been started on a long tunnel at the Zeibright mine, near Emigrant Gap, Nevada County, operated by Empire Star Mines Co., Ltd., John Mann, manager, which when completed will make possible disposal of tailings from the Zeibright mill, at Omega Diggings, near Washington and the South Yuba River served by the new Upper Narrows débris dam near Smartville, Yuba County. The mill has been closed since the tailings dam was washed out 18 months ago, but underground development at the mine continues. Before the shutdown a production of more than 900 tons of ore a day was maintained. Arthur Swanson is superintendent at the Zeibright property.

▶ Sinking of a two-compartment shaft is in progress at the Loretta gravel mine near Railroad Flat, Calaveras County, where a new headframe, gravel-washing plant, and other surface structures have been completed recently. The shaft will be deepened to 220 ft. to explore an ancient river channel traversing the Loretta property. The work is directed by F. J. Forbes, the owner. About 10 men are employed.

▶ Horseshoe Dredging Co. has moved its equipment formerly operated on Cherokee Creek in Calaveras County to a large gravel deposit on Esperanza Creek near Railroad Flat, Calaveras County. George H. Butler is in charge of operations.

▶ Development work is in progress at the Hoge mine, in the Harmony Ridge area near Nevada City, Nevada County, taken over recently by Clarence and Leo Cooley, operators of the nearby Tennessee Flat property. The mine was operated formerly by Hoge Development Co., of Nevada City, with milling ore being treated in a 75-ton flotation plant.

▶ Increased mining operations are scheduled to commence soon at the Gold Wreath mine, in Quartz Valley near Yreka, Siskiyou County, following completion of plant buildings and other preliminary work. Construction of a mill is planned. A crew of 12 men is employed under the direction of C. G. Rogers, superintendent.

▶ Installation of a 100-ton ball mill has been completed at the Domingues mine near Hornitos, Mariposa County, operated by E. Roblin and associates. At the mine, development proceeds according to plan, and operating conditions have been improved materially since bringing electric power to the property.

▶ Walter W. Bradley, State Mineralogist, calls attention to the passage at the 1941 session of the Legislature of Senate Bill No. 845. This bill amends Section 2313 of the California Public Resources Code, relating to mining claims, tunnel locations, and millsites, and the recording of notice of location, marking of boundaries, and performance of discovery work. The bill was signed by the Governor and becomes effective Sept. 13, 1941. The new law, which is Chapter 644 of the Statutes of 1941, reads as follows: "Within ninety days after the posting of his notice of location upon a lode mining claim, placer claim, tunnel right or location, or millsite claim or location, the locator shall record a true copy of the notice together with a statement of the markings of the boundaries as required in this chapter, and of the performance of the required discovery work, in the office of the county recorder of the county in which such claim is situated. The county recorder shall receive a fee of one dollar ($1) for this service."

▶ Twelve men are employed at the Osdick tungsten claims at Atolia, Kern County, taken over recently by Mine Development Co., H. S. West, president. Hoisting equipment and camp buildings have been completed at the 170-ft. Skylark shaft, and shipment of ore has started. James I. Moore, Jr., engineer, is in charge of operations.

▶ Dredging operations have been started at the Poverty Hill placer mine, near Strawberry Valley, Yuba County, formerly operated by hydraulic methods by Poverty Hill Mining Co. The dredge employed is that formerly used in the Iona area. Electric power is obtained from a 15-mile power line completed recently. The property is owned by Alfred L. Oyster, of San Francisco, and the new company, known as Poverty Hill Properties, is managed by W. W. Johnson, an associate. Army Adams is in charge of the dredge.

▶ Erection of a small mill is nearing completion at the Funny Bug mine, in the Gold Hill district near Placerville, El Dorado County, owned and operated by H. H. Smith. The property is opened by a 200-ft. shaft and laterals. Ore from development containing gold, copper, and antimony is stored on dumps.

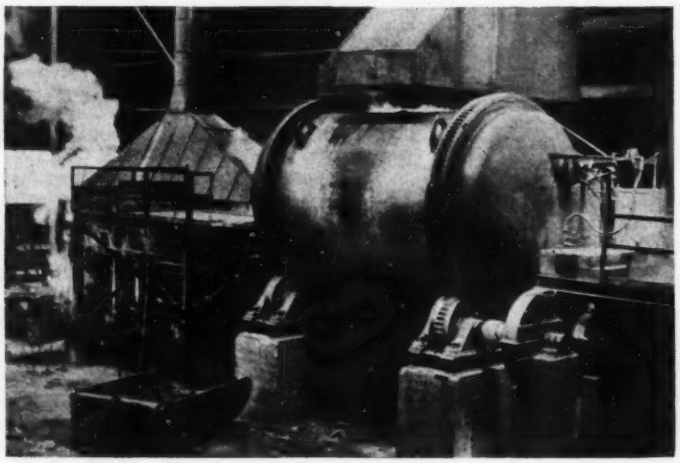
American Mining Congress To Meet in San Francisco

"METALS FOR DEFENSE" will be the keynote of the eighth annual Metal Mining Convention and Exposition of the American Mining Congress, Western Division, to be held at the Fairmont Hotel, San Francisco, Calif., Sept. 29 to Oct. 2.

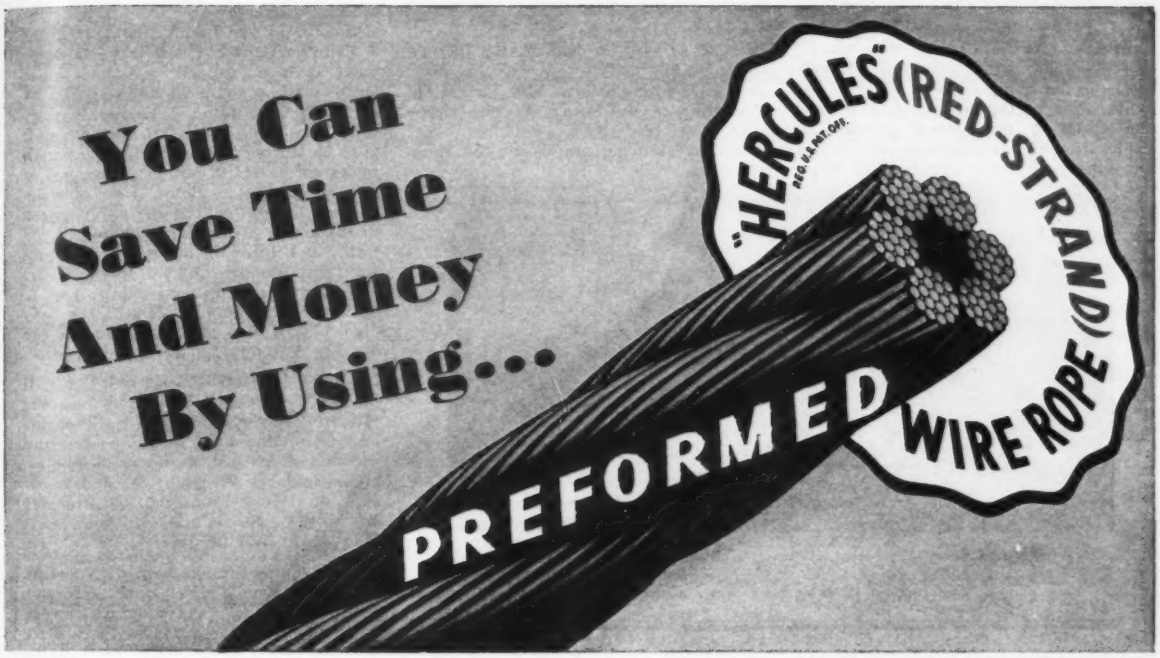
Executives and operators will have the much needed opportunity to meet manufacturers of mining equipment and their representatives to discuss their needs, and also will provide a basis for cooperation in working out problems of priority controls, and other situations created by these unusual times.

Among speakers will be Albert W. Hawkes, president Congoleum-Nairn Corp., and president of the U. S. Chamber of Commerce, who will address the meeting on "Labor Relations and Defense Production." Ivan Block, chief of marketing division Bonneville Power Administration, will present an address on "Western Power Production and Mineral Development."

The latest practices in mining, milling, and other phases of the industry will be discussed. Use of conveyors underground will be described by Robert W. Hughes, general superintendent, Miami Copper Co. Papers on belt conveyors use of slushers, mechanical loaders, and drill jumbos will be presented. Charles Q. Kunke, mine superintendent, Golden Queen Mine, will discuss "Hot-Milling of Detachable Bits. James K. Richard-



Copper mined at the Chino property, at Santa Rita, New Mexico, finally reaches this copper-casting furnace at the smelter of the Nevada Consolidated Copper Corporation at Hurley, New Mexico



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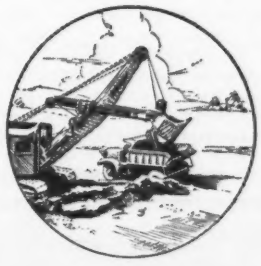

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son, safety director, Climax Molybdenum Co., will present a paper on Accident Prevention in the Present Emergency." A session devoted to strategic minerals and the relation of new Federal and State taxes to the mining industry and the effect of government policies on exploration and development will present an opportunity for analyses of these subjects by executives and operators.

The arrangements committee, with P. R. Bradley, president Alaska Juneau Gold Mining Co., as general chairman, and Albert F. Knorp, secretary Gold Producers of California, as vice chairman, has perfected plans for social activities assuring enjoyment for those attending.

West Coast Mines, Inc., a new producer in Nevada, operates this 150-ton flotation mill treating gold-silver ore from its property in the Barrett Springs district about 12 miles from Winnemucca, Nev.

NEVADA

Prince Mine, Near Pioche, Being Dewatered

Diamond drilling has determined zinc ore in depth that will be developed by Prince Consolidated Mining Co.—Magnesite output from State increasing

▶ Mine working of the Prince Consolidated Mining Co., in the Pioche district, Lincoln County, extending to a depth of 900 ft., are being dewatered in preparation for production of manganiferous lead-zinc-silver ore, that will be trucked to the 500-ton selective flotation mill now near completion at the Caselton shaft of the Combined Metals Reduction Co., controlled by the National Lead Co. In the Prince mine, diamond drilling has established the presence of bodies of high-grade zinc ore below present shaft workings. D. L. Gemmill is manager at Pioche.

▶ Nearly contiguous deposits of magnesite and brucite in the Mammoth district, northwestern Nye County, are producing in fast-growing volume, both products trucked 32 miles to the rail point at Luning, Mineral County. Magnesite from this point will supply both the Permanente Corp. magnesium plant at Los Altos, Calif., for which the RFC has advanced $9,250,000 and the first unit of which was reported ready to operate, and the magnesium plant to be built near Las Vegas, Nev., for the Federal Defense Plant Corp. and operated by the newly formed Basic Magnesium, Inc., an affiliate of Basic Dolomite, Inc., of Cleveland, Ohio. Howard P. Eells, Jr., of Cleveland, is president of both. With a total of $63,000,000 of government funds allocated for the Las Vegas and supplementary plants, separate units will include the main recovery plant between Las Vegas and Boulder Dam, a calcining plant at the magnesite deposit or at Luning, a water-supply and pumping system to bring water to the main plant and town from Lake Mead, above Boulder Dam, and a salt-mining project near the lake to provide 100,000 tons of salt annually for use in the recovery process. Distance separating the deposit and plant is around 400 miles airline, or nearly 1,000 miles by present connecting railroads, either by way of Ogden, Utah, or through central California. Nearly direct rail connection can be obtained by reconstruction of a 66-mile gap between Goldfield and Beatty, where rails have been removed but a fair roadbed remains. Brucite from the Mammoth deposit, largest and highest in quality of any known to United States Bureau of Mines authorities, is shipped at the rate of 150 tons per day to the Maple Grove, Ohio, plant of the Basic Dolomite, Inc., for use as furnace lining in the steel industry. This operation is conducted by the subsidiary Basic Ores, Inc., for which Charles E. Schwab is manager at Luning.

▶ Excavation and concrete work has been completed by the International Smelting & Refining Co. for a new three-compartment shaft on property of the Copper Canyon Mining Co., 16 miles southwest of Battle Mountain, in Lander County. Construction of a 500-ton flotation mill is to be started at once by International, under terms of its option on control of Copper Canyon. Some lease ore is shipped to smelter, but the company ore is stockpiled to await completion of the mill. J. J. Lillie, manager for the Mountain City Copper Co., an International subsidiary, is in general charge and L. E. Snow, of Bingham, Utah, has succeeded S. K. Droubay, engineer for the Walker Mining Co., as superintendent.

▶ During July the 150-ton flotation mill of the West Coast Mines, Inc., in the Barrett Springs district, Humboldt County, produced 900 tons of concentrate containing 126,000 lb. lead, 55,000 oz. silver, and 650 oz. gold. W. J. Kamenzind, of Sacramento, Calif., is president and J. F. Cowley is manager, with headquarters at Winnemucca.

▶ Mine equipment has been delivered at the Alabama gold-silver mine, a former producer in the Awakening district of Humboldt County, where the main shaft is to be deepened from the 300 level to the 500 ft. The property has been acquired under option by Walter Seligman, of New York City, through the agency of Owen Sullivan, of Reno. Work will be directed by Roy A. Hardy, consulting engineer for the Getchell Mine, Inc., and executive head of the Adelaide-Crown Syndicate. The Alabama has a substantial reserve of good-grade ore that will be trucked to the Adelaide-Crown's lately enlarged 200-ton custom cyanide mill, 12 miles south of Golconda. Joseph Morris, of Lovelock, is superintendent.

▶ Property of the Buffalo Valley Mines, Inc., in northwestern Lander County, to which a $20,000 development loan was advanced by the RFC two years ago, is to be further developed under an option agreement by Hollis E. Chatwin, Utah engineer who has been shipping manganese ore from the Black Diablo property in the Pumpernickel district, Pershing County, to the Provo, Utah, blast furnace of the Columbia Steel Corporation. Chatwin's plan is to truck ore to the Adelaide-Crown custom mill, 20 miles distant.

Near Mill City, Nev., the Nevada-Massachusetts Co. is treating about 250 tons of tungsten ore in its concentrator shown above

▶The Natomas Company has taken over some 7,000 acres of tested gravel deposits of the Greenan Placers, Inc., under an agreement that is virtually a lease with graduated royalty, according to President James O. Greenan at his Reno office. As a result, the Greenan company will not avail itself of the RFC advance of $1,050,000 that had been authorized and made available for dredge installation. Reports state that close drilling and shaft sinking to bedrock have proved more than 60,000,000 cu.yd. of gravel with average gold content above 20c. per yard. Thomas McCormack, of Sacramento, Calif., is president of Natomas and Richard G. Smith is manager of dredging operations.

For Old "Sourdoughs"

AMONG the achievements of pioneers in the mining industry that should be passed on to posterity is that masterpiece of the culinary art—sourdough pancakes. Old sourdoughs will be interested and pleased to learn that *Gourmet*, New York magazine of good living, thought well enough of the delicacy to publish the recipe in its March, 1941, number, as follows:

SOURDOUGH PANCAKES

(Makes 18)

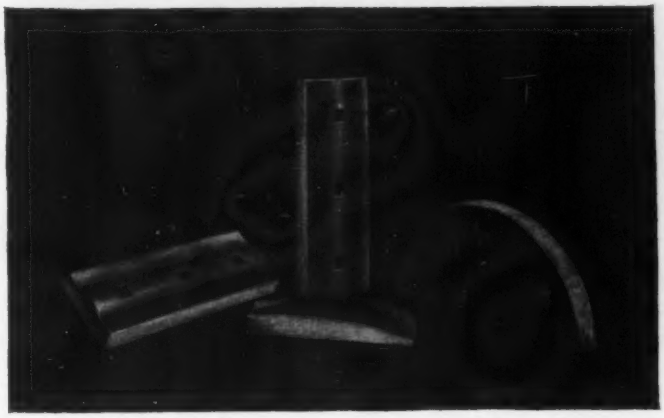
Alaska is the land of the sourdough pancake, a palate-tickler made without milk, which is the disastrous ingredient in all bad pancake practice. In the days of the gold rush, the utter absence of lacteal fluid made it obligatory upon the populace to perfect a pancake without milk in any form. As a result, the territory became the center of a cult that achieved the ultimate in sourdough products. Here is the recipe as the "sourdoughs" handed it down.

Take 1 cup sourdough (see below), stir in 1 cup flour, let stand overnight. Then add 1 cup water and 1 egg. Beat thoroughly. Sift into this another cup of flour, to which has been added ½ teaspoon salt, 1 tablespoon granulated sugar, and 1 teaspoon soda. Beat with a spoon or a small wire whip until smooth. Add 1 tablespoon bacon dripping, or, still better, melted fresh bacon fat, and fry on a hot griddle. Remember that the batter should be about the consistency of heavy cream.

To make Sourdough: Mix 1 cup flour and 1 cup water; let this stand two or three days in a warm place until fermented. Or a little unused pancake batter may be allowed to sour, or bread sponge can be used, but should be quite sour. The sponge, of course, which ferments the quickest of all, can be purchased at a bakery, and if water is added after each making, the original start of sourdough can be drawn upon indefinitely—a fact upon which the sourdoughs depended in the wilds.

"STEEL MINING CASTINGS OF EVERY DESCRIPTION"

BALL MILL LINERS MADE OF JOLIETTE AUSTENITIC MANGANESE STEEL



SOME FACTS ABOUT AUSTENITIC MANGANESE STEEL CASTINGS

▶Joliette Steel Limited produces castings of every description made of the various Carbon Steels and Alloy Steels but at least 75 per cent of the castings we make are made of Austenitic Manganese Steel.

▶The large number of repeat orders we receive year after year for Wearing Parts made of Austenitic Manganese Steel leads us to believe that for many Wearing Parts subjected to certain service conditions no better metal has yet been found.

▶Ball Mill Liners are excellent examples of such Wearing Parts. Because Austenitic Manganese Steel possesses the peculiar characteristic of hardening on the surface when pounded, the metal on the surface of Ball Mill Liners of Manganese Steel in service is found to be dense, hard and wear-resisting while the metal in the body of the Liners is tough but only moderately hard. As the hard surface wears away, a new one is formed by the pounding so that a new thin wear-resisting surface is constantly being created. The softer metal underneath this thin wear-resisting surface forms a tough body which resists shock and in so doing prevents cracking.

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Successfully operated since 1939, the Boaz mine, near Norris, Mont., has been efficiently producing and treating about 50 tons of gold ore daily in its mill shown above. Development in the mine is now under way below the 500 level

MONTANA

Boaz Mine Plans Deeper Development

Equipment installed for mining below 500-ft. level through a winze sunk to 800-ft. horizon

▶ The Boaz mine, 5 miles southeast of Norris, Mont., in the Tobacco Mountain range, will be developed in depth. A new station on the 500-ft. level has been completed and a hoist has been installed underground, permitting hoisting from a 300-ft. winze. From the bottom of the winze about 2,000 ft. of drifting and crosscutting is planned. A modern 50-ton cyanide plant completed in 1939 treats the gold ore, with operations maintained throughout the year. The flowsheet and metallurgical direction of the plant was done by Vern Zeigler, of the Hecla Mining Co. Consulting engineer for the company is Dr. Francis A. Thomson. Bruce Landers is mine superintendent and John Hughes mine foreman. K. S. Lynch is mill superintendent. The property is owned by Shirley D. Parker, of Seattle, Wash.; Gover Burrows, Yakima, Wash.; and Arthur J. Theis, resident manager.

UTAH

Copper Ore Found in Park City District

Development in the Mayflower tunnel of the New Park Mining Co. discloses presence of covellite

▶ Building of the railroad spur by the Union Pacific Railroad from Keetley, in the East Park City district, to the portal of the Mayflower tunnel is 50 percent completed, General Manager W. H. H. Cranmer of the New Park Mining Co. reports. Completion of the two-mile branch line about the middle of September will mark an important point in the development of the New Park Mines enterprise. About 200 tons of silver-gold ore is being shipped daily from the Mayflower tunnel, and 190 men are employed. Mr. Cranmer states that the Mayflower orebody is now more than 1,750 ft. long, with an average width of 7 ft. Recently, at the face of the Mayflower tunnel, 8,000 ft. in and leading into virgin ground, covellite, a copper ore, a new occurrence in the Park City district, was struck. An 8-ft. face of ore is being developed on the 700 level, 100 ft. above the tunnel. The New Park Mines Co. is installing 36-lb. rails in the tunnel; new 40-cu.ft. mine cars have been ordered; a 44,000-volt line is being run by the Utah Power & Light Co. to the company's Park Galena property; a 150-hp. hoist capable of reaching to a depth of 1,500 ft. is to be installed at the shaft being sunk between the 7,000- and 8,000-ft. marks in the Mayflower tunnel; and a new 300-hp. compressor has been ordered. The Morris-Knudsen Co. is building the railroad spur for the Union Pacific Railroad.

▶ Completion of the 4.5-mile Elton tunnel of the National Tunnel & Mines Co. leading into the Bingham district was celebrated at Tooele on Aug. 22. Official statistics show that during the driving of a mile of the tunnel in the last half of 1940, the average footage made in three shifts was 31.8, or 10.6 ft. per shift; average pounds of powder per ft., 23.49, and 6.02 lb. of caps. A total of 3,145 ft. or 56.8 percent of the mile distance, had to be timbered. An important byproduct of tunnel driving has been the development of 4,000 gal. of water a minute used to open up a new homestead district. The water is conveyed to the Elrose subdivision of Tooele, consisting of 1.1 acre homesteads. A total of 2,500 trees have been planted. Frame and stucco homes, 25x32 ft., are being built. A new city park is included in the section. Ten homes were built last year and close to 25 homes will be built this year. When the subdivision is completed, it will contain nearly 100 new homes for employees, many of whom are moving from Bingham.

▶ The Frisco Silver Lead Mining Co. (Ness Building, Salt Lake City) will deepen its winze on the 300-ft. level to reach the 400 level of the Frisco district property near Milford. On the 400 level, according to Manager L. F. Block, the company plans to work the deposit, which on upper levels produced ore carrying silver, lead, and gold values. Assays of ore in the winze run 20 oz. of silver to the ton, 27 percent lead, and 0.02 oz. gold.

▶ Douglas Despain, of Park City, has been granted a lease on the Park Flag mine. Despain has 20 men employed in the upper levels producing silver-gold ore.

▶ The Ohio Copper Co. (Dooly Block, Salt Lake City) is treating 1,000 tons of tailings every 24 hours at its Lark, Bingham district, plant. The company estimates that it has sufficient tailings for ten years more of operation. About 8,000 lb. of copper daily are being produced from tailings carrying one-half of 1 percent copper. In addition, 1,500 lb. of copper daily are being recovered by leaching-in-place of the caved area in the Bingham mine.

▶ Kentucky Utah Mining Co. reports that the drift being advanced from its Big Cottonwood tunnel is within 300 ft. of the old Woodlawn workings.

▶ The Mountain Mines Co. tunnel, also in the Big Cottonwood district, recently struck a heavily mineralized fissure near the 3,000-ft. mark in its Mineral Fork property.

▶ Mine employees of the Mountain City Copper Co. at Mountain City, Elko County, were granted an increase in wages of 50c. daily on Aug. 9.

▶ Silver Shield Mining & Milling Co. has entered into a contract with the United States Navy for a certain quantity of dead-burned magnesite. The magnesite property is at Fish Springs, Juab County, Utah, about 125 miles southwest of Salt Lake City. Harry S. Joseph is general manager, 409 Hooper Building, Salt Lake City, Utah.

COLORADO

El Paso Mine Reveals Good Ore in Depth

Leasers operating property in Cripple Creek district making steady shipments from ore developed below Roosevelt tunnel level

▶ At the El Paso mine, Cripple Creek district, a winze was sunk recently 104 ft. below the Roosevelt tunnel level by Copeland and Knight, lessees. Drifting on the vein has advanced about one hundred feet and the first car of ore shipped from this operation settled for $57.49 per ton. Copeland and Knight are also driving a crosscut on the eighth level. The Harry B. Woodward & Co. lease on the sixth level is nearing its objective after approximately 400 ft. of development work. A number of small veins show good values.

▶ Charles Carlton, superintendent of the Ajax mine, Cripple Creek, says Ajax is preparing to sink the main shaft to the

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▶COLORADO

new Carlton drainage tunnel level. It will be sunk in lifts of 175-ft. through the distance of 500 ft. Following the drainage of the Portland and the connection to the winze level, this sinking program will be under full operation.

▶ Daniel P. Smith, of Boulder, has formed the Pine Cone Syndicate to develop the 27-acre gold property at Sunshine. The Syndicate has a 200-ft. tunnel and a total of 1000 ft. of work completed.

▶ C. C. Stearns has been made superintendent of the U. S. Vanadium plant at Rifle, Colo. A car of vanadium ore is being shipped in daily from Thompsons, Utah, and piled along the mill. A crew of men is working the company vanadium mine. Therefore an ore supply will be available when the mill starts operation.

▶ William Lonergran has bonded his Cincinnati group of claims on Blair mountain, about one mile from Silverton, to a syndicate of Arizona and New Mexico mine operators. A power driven blower is being installed, and this will be followed by the installation of compressors and drills.

▶ The Alma-Lincoln Mining Co., at Idaho Springs, has opened up a good body of ore which gives promise of being much better than that mined to date, assays indicating same to be about double in value the ore now being mined. The Alma Lincoln Co. is reported to have suspended operations on the Lord Byron mine, in Spring Gulch, and will do some custom milling while developing new orebodies.

▶ A 25-ton car of six and one-half ounce ore was shipped from Conrow & Ashenden lease on the 500-ft. level of the Portland No. 1 shaft. Work is moving along rapidly at the Portland so as to have everything ready on the surface when the mine is drained by the Carlton tunnel, according to Superintendent Salsbury.

▶ Dr. W. F. O'Brien of Leadville has leased the famous Matchless mine from the Shorego Mining Co. Associated with Dr. O'Brien are a number of former employees of the mine. He is considering sinking a new shaft, and erecting a monument to Tabor and his wife—"Baby Doe."

▶ The Climax Molybdenum Co., at Climax, largest producer of molybdenum in the world, is working at capacity, and recently established a new monthly output record—turning out contained molybdenum at the rate of more than 31,000,000 lb. annually; as compared to 22,000,000 lb. in 1939 and 23,000,000 lb. in 1940. Jack Abrams is general superintendent. Completion of new ore-roasting capacity at the plant in Pennsylvania will permit greater output of molybdenum. One roaster has been completed and another will be put into operation in September.

▶ According to T. S. Lovering, of the U. S. Bureau of Mines, geophysical methods of prospecting for tungsten ore have met with little progress. Ferberite, an excellent conductor of electricity, differs little from the barren quartz vein with which it is associated. Its density is large, but calculations by Prof. C. A. Heiland indicate that a torsion balance would have to be set up within 25 ft. of one of the largest orebodies before its presence would be indicated by the instrument. The oreshoots are more open, and water-bearing, and hence more conductive than other parts of the vein, and it was hoped that these permeable parts could be located by resistivity measurements. Such measurements were made by the Wolf Tongue Mining Co. on other ores of relatively high conductivity along different veins: but the results of diamond drilling at the points indicated proved of no value, though strong flows of water come from most of the places tested.

▶ The Western Machinery Co. has completed its plant at Cripple Creek, and is now screening approximately 500 tons daily. The equipment installed consists chiefly of the manufacturers' vibrating screen, conveyors, and grizzly. Charles Zaring is superintendent, and Charles Berle, of Colorado Springs, is general manager. The screenings are shipped to the Golden Cycle mill, Colorado Springs.

▶ The Donna Juanita mine resumed operations early in July, after a long shutdown, during which time the company spent some $50,000 in rehabilitation and repairs. Present production is at the rate of close to a carload of ore a day treated at the company mill in Idaho Springs. The concentrates are shipped to Leadville.

IDAHO

Bunker Hill Plans Addition to Smelter

Fuming plant will reclaim zinc in slag dump—Six-day week being considered by large lead-zinc producers in Coeur d'Alene district

▶ Bunker Hill & Sullivan Mining Co., at Kellogg, is reported to be drawing plans for the construction of a new million-dollar unit to be added to the present smelting plant. The proposed addition will be a fuming plant, designed to recover the lead, zinc, and cadmium from smelter slag. The only two other similar plants in the Northwest are at Toole, Utah, and Trail, B. C. The Bunker Hill slag dump is considered to be one of the largest deposits of reclaimable zinc in the West. It is estimated it will take about a year to complete the new unit after actual construction is started.

▶ The larger mining companies of the Coeur d'Alene mining district are reported to be considering a six-day work week to speed up production of lead and zinc. The new program would add one day to the week and a day and a half pay under the wage-hour ruling of time and a half for overtime.

▶ Silver Dollar Mining Co., Coeur d'Alene district, has opened 4½ ft. of commercial silver ore in a winze being sunk on the hanging-wall vein on the 1,400 shaft level. Average muck samples assayed from 28 to 34.4 oz. silver per ton, with high-grade streaks running up to 140.2 oz.

▶ Polaris Mining Co. has started driving a long crosscut tunnel from its 2,300 level to the Mineral Mountain Mining Co.'s claims 1,550 ft. to the north. The crosscut will cut through Polaris and Chester ground, opening up unprospected territory in these two properties and the Mineral Mountain vein some 1,600 ft. below surface workings. Work is being financed by the Mineral Mountain Co., of which Fred Thiel, of Wallace, is president.

▶ Sunshine Consolidated, working on the 3,100 level of the Sunshine mine, is drifting on a streak of high-grade silver ore showing from a foot to 18 in. in width and averaging about 50 oz. silver per ton. The drift is still several hundred feet east of an expected oreshoot located on a higher level by diamond drilling.

▶ Lucky Friday mine, in the Mullan district, scene of an important lead-silver strike last month, is showing steady improvement in the east drift on the 300 level. It is reported the ore is 6 ft. wide and of high-grade mill feed. Ore is being stored for shipment to the Golconda mill.

▶ A valuable body of tungsten ore has been discovered in the Lost River district, north of Sun Valley, according to Lorne Campbell, an associate of Courtis Brothers Co., of Detroit. Samples will be tested and development work will begin in the near future.

▶ The Lynch-Pine Creek Mining Co., operating in the Pine Creek district west of Kellogg, has driven 500 ft. in its new deep tunnel, which will cut the Lookout vein system 700 ft. deep and the Hershey fissure at 1,400 ft. H. Herman Miller, Kellogg, is manager.

▶ A compressor and pumping system have been installed at the Croesus mine, Hailey district, according to Henry Olander, of Hailey, manager. The old shaft will be unwatered and production will be started from the lower levels.

▶ The Hope lead-silver mine, at Clarksfork, has started steady production, according to Albert M. Nash, of Clarksfork, manager. Recent shaft work has exposed a larger vein and orebody than opened on the upper levels. Values are in lead-silver-zinc. The shaft will be sunk to the 1,000-ft. level.

▶ Laylander Exploration Co. is drilling the Northfork Canyon below Salmon, Idaho, preparatory to installation of a dredge to recover the gold values.

▶ The main Cœur d'Alene Mines shaft has been completed to the 1,750 level, according to company engineers, and the work of cutting a station on the 1,600 level is now in progress, and as soon as this is completed a crosscut will be driven to the vein, an estimated distance of 700 ft. The company is now milling approximately 325 tons a day and machinery has been ordered to increase the mill capacity to 600 tons. Concentrates are shipped to the Bunker Hill smelter at Kellogg.

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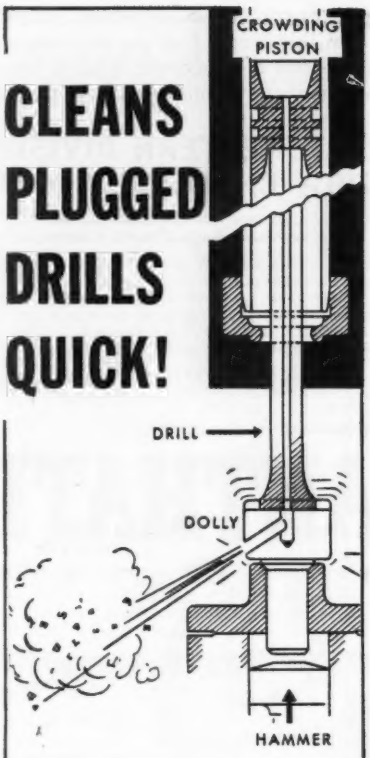

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ARIZONA

Magma Copper Installs More Air Conditioning

Reduction of temperature underground will permit mining to 4,600 ft. level—Work ahead of schedule at Morenci—Lower level of Junction mine flooded

▶ To increase America's supply of copper urgently needed in national defense work, Magma Copper Co. has just installed three new 140-ton centrifugal machines to provide air conditioning down to the 4,600-ft. level of its mine in Superior, Ariz., according to Edward T. Murphy, vice president Carrier Corporation, Syracuse, N. Y. This marks the third extension to the original air-conditioning system, which was designed and engineered by Dr. Willis H. Carrier. Temperatures in the Magma mine range from 127 deg. on the 3,200-ft. level to 150 deg. on the 4,600-ft. level. This new installation is expected to cut temperatures down to 90 deg. at the deepest workings. In 1937 two Carrier centrifugal refrigeration units, supplying cooling equivalent to the melting of 560,000 lb. of ice every 24 hours, were installed. One cooled the air for the 3,400-ft. level and the other for the 3,600-ft. level. Each unit is designed to cool 30,000 cu.ft. of air per minute: 10 deg. In November, 1939, a third unit was installed and located on the 4,000-ft. level. One of the three new centrifugal machines will be placed on this level. The other two will be put in operation on the 4,200- and 4,400-ft. levels, the latter machine supplying refrigeration to the 4,600-ft. depth. Additions to the present system make the air-conditioning system in the Magma the largest mine installation in North or South America. The six units, doubling the previous system, boast a total capacity of 840 tons, equal to the melting of 1,680,000 lb. of ice daily. The installation was supervised by C. B. Foraker, safety and ventilation engineer for the Magma Copper Co.

▶ Progress made at the Morenci unit of the Phelps Dodge Corp. indicates that work on the smelter and concentrator is about two months ahead of schedule and operations may be started early in November. The pilot mill is treating around 3,000 tons of copper ore a day, averaging 1 percent copper. Construction is maintained on the smelter and concentrator on a three-shift basis. Ernest Wittenau is in charge of operations.

▶ A large flow of underground water broke into the 2,700-ft. level of the Campbell mine, Copper Queen Branch, of Phelps Dodge Corp., near Bisbee, Ariz., late in the afternoon of Aug. 30. In the first 24 hours water rose 118 ft.; 15 ft. on the following day and by Sept. 2 it had gained an additional 8½ ft., or a total rise of 141½ ft. as of that date. Pumps on the 2,700-ft. level were drowned out, but main pumping equipment on the 2,200-ft. level continued in service. Relay pumps have been installed on the 2,433-ft. level, together with deep-well pumps on the 2,200-ft. level, all of which deliver water to the main 2,200-level pump station. Operations on the levels flooded were confined to development and exploration; therefore it is believed the copper output by Phelps Dodge in September will not be greatly influenced by the flooding. Lower levels of the Denn mine of Shattuck Denn company being connected with the Junction mine were also flooded. Water in this property is expected to recede as pumping continues at the Phelps Dodge mine. Plans are being made for the prompt purchase and installation of new pumping equipment to expedite unwatering and as a protective measure in case of unexpected major flows of water.

▶ The 250 ton daily haulage of ore from the Tyro mine to the milling plant of the Gold Standard, Inc., has changed from a constant stream of small trucks to one large carrier. A diesel-powered Mack truck of 25-ton capacity has been put on the haul, making eight trips each eight hours and carrying loads of 30 tons of ore per trip. The company makes the claim that the hauling cost is greatly reduced with the big truck. Richard de Smet is general manager of the Gold Standard company with address at Kingman, Ariz.

▶ The mill at the old McGuire property, three miles southwest of Kingman, is being rehabilitated and some new machinery installed. It is expected that the mill will be ready early in September C. B. Wilkinson, of Kingman, is in charge of operations.

▶ Davenport Mining & Reduction Co. is completing the remodeling and the installation of new machinery in its mill in the Layne Springs country. The Davenport company controls the Oro Plata, Middle Golconda, and Idaho mines and will draw from these gold, silver, lead, and zinc properties for the mill supply. Ogden C. Chase, of Las Vegas, Nev., is president of the company.

▶ Frank C. Mitchell, owner of manganese deposits in the southern end of Mohave County near the shores of Lake Havasu, is installing a barge service whereby the manganese ores can be floated down the lake to the Parker dam, where it is reloaded for transportation. Little sorting is said to be necessary to bring the grade to market specifications as required by Federal regulations.

▶ The old C. O. D. mine, about 15 miles north of Kingman on the east slope of the Cerbat Mountains, has recently been taken over by R. P. M. Davis, of Hollywood, Calif. M. B. Dudley, is owner of the lead-zinc property. Davis plans the erection of a 50-ton flotation mill. His address is Congress Junction, Ariz.

▶ King of Secret Pass Mining Co. has recently received satisfactory returns from a number of 50-ton ore shipments to the Producer's mill at Chloride. The company is operating the property under lease from Walter M. Harrison. J. H. Hoffman, of Kingman, is in charge of the company's affairs and R. C. Ferguson is superintendent at the mine.

▶ The Equator property, near Cottonwood, Ariz., is producing 50 tons of gold and silver ore daily. Considerable diamond drilling is being done in the exploration of the old workings. The

property is owned by the Phelps Dodge Corp. A. B. Peach is directing the operations and has about 35 men on the payroll. R. D. D'Arcy is mine superintendent. Clemenceau is the postoffice address.

▶Dell Potter, of Clifton, Ariz., has leased his manganese properties, situated north of Clifton, to G. I. Pace, of Morenci, and equipment is being placed on the property preparatory to production.

▶Approximately 300 tons of lead-zinc carbonate ore has recently been shipped from the Lime Cap group of mines north of Clifton. The ore was shipped to the Ozark Smelting & Mining Co., of Coffeyville, Kansas. The ore also carries some vanadium and manganese. The property is operated by the Danenhauer Brothers and associates, of Duncan, Ariz.

▶About 80 tons of 4 percent copper ore a day are being milled at the Central Mines near Oracle, Ariz. The ore is in a chimney formation and has been developed to a depth of 300 ft. and shows a width of 30 ft. and a length of over 70 ft. About 45 men are employed. Newt C. Wells, of Oracle, is manager.

▶A group of cinnabar claims known as the Cornucopia and L. and N., situated in the Saddle Mountain country, have started production. The retort capacity is one and a half tons every 24 hours and plans provide for keeping the retort in continuous operation. The group is leased to J. F. Vassar from Chris Martin, and Charlie Ward, all of Mesa, Ariz.

WASHINGTON

Slate Creek Area Being Investigated

American Zinc, Lead & Smelting Co. prospecting for lead-zinc ores in Metaline district

▶American Zinc, Lead & Smelting Co., which heretofore has operated in the Metaline district only on leases, has located in its own name 31 mining claims in the Slate Creek region of the Metaline. The company has prospected some of the ground by short holes. This district was prospected and abandoned several years ago by Bunker Hill & Sullivan Mining Co. and others. The new operators hope to find ore below the shale.

▶The Silver Bell Mining Co., Charles W. Freese, secretary, reports the company has encountered a second oreshoot in 150 ft. of drifting on the vein. It has a full face of ore that has been broken to a width of 5 ft. without encountering the wall. Doyle & Walker, contractors, are advancing 6 ft. a day. Values in the first oreshoot ran from $3.28 to $27.

▶J. G. and Everett Hougland report an output of about 900 tons of gold ore a month from the Golden Valley mine, north of Republic.

▶Kromona Mines Corp., which has a lease and option on the Florence Rae mine, in Sultan Basin, western Washington, is making shipments of its copper-silver-gold ore to the Tacoma smelter.

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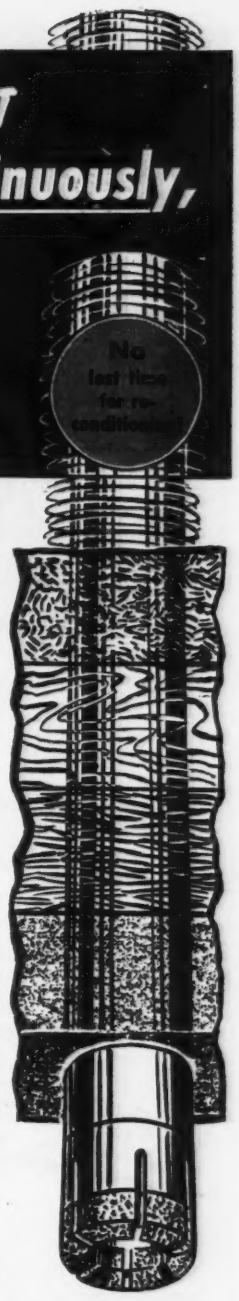

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▶WASHINGTON

Seven ft. of high-grade copper ore is reported in the Copper Knob claim of this property. It is mined in an open cut. Fifteen men are employed under B. Knudsen, superintendent. Joe F. Krom is president.

▶ Metaline Mining & Leasing Co., in the Metaline district of northeastern Washington, reports a four-months' operating profit of $17,802 from 24,859 tons of ore. This company is operating the Grandview mill, handling its own ore and ore of the Grandview mine. Metaline Mining & Leasing Co. has an indebtedness of $667,843 to the American Zinc, Lead & Smelting Co., which is to be paid ahead of dividends.

▶ Claud Trevitt and Emmett Pierce have developed the South Penn mine near the old Mountain Lion mine, at Republic, and already have made substantial shipments of the gold ore.

ALASKA

Many Districts Being Studied for New Deposits

Source of tin in placers being investigated —Independence mine adding new equipment to mill

▶ Alaska Department of Mines is having its heaviest year of investigations under the direction of B. D. Stewart, Commissioner of Mines, who is supervising operations in many sections of the territory, with associate mining engineers in charge. Harry L. Fiedler has made an examination of the Prince William Sound area. Henry R. Joesting and an assistant made a month's field trip on foot in the area between Richardson Highway, near Mount Hayes, and the Bonnifield district along the Alaska railroad at Ferry. Jack Roehm investigated the area between Kamshak Bay and Naknek and from there went to the Kenai Peninsula. A. B. Shallit has been working in the Nome district.

▶ Professor Smith, of the U. S. Geological Survey, is making a survey of placer tin deposits in the Manley Hot Springs district. He hopes to find this important strategic mineral in place. Tin often has been found in sluice boxes of gold placer operators of this district and some of it has been mined and shipped. In hopes of acquiring valuable tin ground, many claims have been staked over a large area.

▶ A $30,000 plant is to be added to the equipment at the Independence, the second largest mine in Alaska. The mine is owned by Alaska-Pacific Consolidated Gold Mining Co., C. L. Harrison, president. The company is building fire walls between its mill and its power house and extending its water supply for further fire protection. At this property diamond drilling is in progress on the Jap claims and surveys are being made of the Ready Bullion claims, recently acquired. Electric locomotives are being installed to handle ore cars. Two hundred men are employed.

▶ Wolf Creek Mining Co. is again in operation in the Fairbanks district, with Mannie Olson in charge. This company has operated on Wolf Creek during several seasons and has a big yardage of gravel awaiting its dragline operations. Work is expected to last several years.

▶ Pete Miscovich is operating the only hydro-electric power placer in the Flat placer region. It is one of the few such operations in the territory. He has a good water supply from Otter Creek, where he installed a turbine three years ago. He has a new operation this year in the Ruby district, where his son is in charge.

▶ Strandberg & Sons expect to operate four draglines this season on their Folger, Candle Creek, Goodnews Bay, and Candle properties, in the Anchorage district. David Strandberg is at the head of these operations.

▶ W. H. Lehman has been exploring the placer property of the late Mike Connolly at Sunrise. It includes 32 claims which the former owner insisted would yield heavily. If Lehman's preliminary exploration is satisfactory he has associates who will join him in its development.

OREGON

Bayhorse Mine to Have 100-Ton Concentrator

Silver-copper property near Huntington, Baker County—Man o' War quicksilver mine developed to production stage

▶ Preliminary work for the construction of a 100-ton mill has been done at the Bayhorse mine, now held by the U. S. Metals Co., situated on Snake River 9 miles north of Huntington, on the Oregon side. The plant is expected to cost about $60,000, depending somewhat on the rising cost of equipment, R. K. Magney, secretary of the company, states. Substantial shipments of silver ore were made from this property from 1921 to 1925. Electric energy for operations will be supplied by Idaho Power Co., which has a line across the ground of the mining company. Mr. Magney says that probably 70,000 tons of ore is available for the mill that will average 17 oz. of silver to the ton. One oreshoot he says is 10 to 40 ft. wide. The ore also carries a substantial copper value. John L. Magney, of Spokane, is consulting engineer of the company.

▶ D. F. Kempfer, of Unity, and W. C. Fellows, of Sumpter, are building a 10-ton retort on a cinnabar showing they developed last winter in Grant County. The property is known as the Man o' War and is in the Greenhorn district. They hold it under bond and lease from George Helmer, of Greenhorn.

▶ L. K. Requa, of the Idaho Almaden mine, at Weiser, Idaho, has taken a

bond on cinnabar ore recently discovered on Connor Creek, in Baker County. The ore is in a dike said to be 200 ft. wide. D. W. C. Nelson, Baker engineer, has surveyed and mapped the property.

▶Idaho Canadian Dredging Co. and Sunshine Mining Co. are installing, as a joint operation, a 4-ft. bucket-line on Burnt River, near Whitney. An official of the Idaho Canadian Co. will conduct the operation.

▶Jackson Mining Co. has been working since May on the George Wendt farm on Daisy Creek, near Jacksonville, where it has 30 acres of land. It also has other acreage under control. E. B. Keels, of Auburn, Calif., is in charge.

▶C. A. Tibbs, of Sumpter, has leased the Bald Mountain property in Baker County and is working it, using a new compressor.

▶Ronald C. Begg, of Jahn Day, has a lease and bond on the Tempest mine, in the Greenhorn district. He has a small crew opening a road to the property. The mine is owned by Otto Simmons and associates.

▶M. A. Doane has sunk an incline shaft in his property near Fields, Harney County, which has disclosed what seems to be a large body of quicksilver ore of a good grade. It is in the southern part of the Steens Mountain country.

Iron Mines in New York State to Reopen

LAST WORKED in 1870, the Clifton magnetite iron deposits, in St. Lawrence County, N. Y., will be rehabilitated and placed in operation by the M. A. Hanna Co., Cleveland, Ohio. Production is expected to start in June 1942. Construction is now under way by the subsidiary known as the Clifton Ore Co., Inc., with mine office at DeGrasse, N. Y. Exploitation will be through a shaft. A beneficiation plant will be built and ore will be sintered. Output of 1,000 tons of sintered product per day is estimated. Officers of the company are George M. Humphrey, president; G. N. Hickok, vice president; E. E. Hunner, general manager; G. M. Cannon, assistant general manager; and Guy B. Hunner, mine superintendent.

Zinc Mining Revived In Arkansas

▶A revival of mining activity in the Rush-Buffalo River zinc district of northwest Arkansas is reported. For some time development operation and clean-up work have been in progress at several mines preparatory to resumption of milling operations as conducted in the region during the First World War. Three mills are under construction, and others are in prospect for early installation, according to J. H. Hand, manager of the Ozark Mine Owners' League. A marked increase in the base price of 40 percent zinc carbonates to $30 a ton, f. o. b. Harrison, also was reported.

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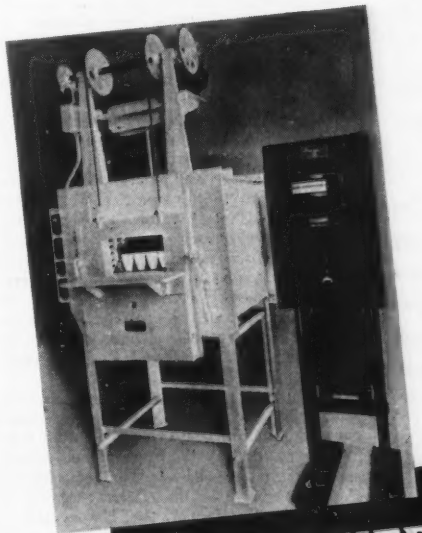

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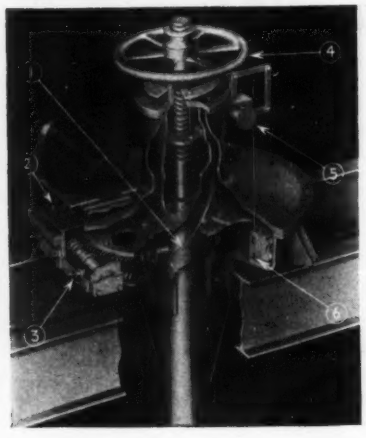

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A.I.M.E. Visits the Iron Country

Starting from Duluth, the party of several hundred members inspects operations on Mesabi range

THE OPPORTUNITY to see the giant Mesabi iron range at its best brought engineers from many parts of the United States and some from Canada to the meeting of the American Institute of Mining and Metallurgical Engineers, which opened in Duluth, Minn., on Tuesday, Aug. 12. Most of those coming from the East and Middle West arrived on a special train that had been provided at Chicago.

Efforts of the Minnesota Section's committee on arrangements, headed by LeRoy R. Salsich, to give the visitors a good time were seconded by the weather. The year was a propitious one for this the first regional meeting of the A.I.M.E. to be held in the Lake Superior Iron Country since 1920. A record output of iron ore in 1941 to aid the defense program has been every operator's goal since the close of the 1940 shipping season, and as a result activities at the mines and beneficiating plants were at their peak.

As arranged, the program provided a two-day field trip over the Mesabi, after the opening day in Duluth, and a day of sight-seeing trips and golf following the return of the party to the city. After registration at the Hotel Duluth on Tuesday morning a luncheon was given at which Mayor E. H. Hatch made the address of welcome. John R. Suman, Texas oil man and President of the Institute, then spoke, making an interesting comparison between the Lake Superior iron region and the petroleum-producing section of Texas, from which he comes.

Tuesday afternoon was devoted to the only technical session of the meeting. The papers were mostly of a character intended to prepare the visitors for what they would see on the Mesabi on the two succeeding days. E. E. Hunner, general manager of M. A. Hanna Co. at Duluth, dealt with the economics of Minnesota's iron-mining industry. Grover J. Holt, assistant to the vice president, Butler Brothers, St. Paul, described the mining practice and means of transport. T. B. Counselman, manager of the Dorr Co.'s Industrial Division in Chicago, discussed developments in the ore concentration practice. And W. A. Clark, engineer for the Duluth, Missabe & Iron Range Railway Co., dealt with the transportation of the ore from the ranges to the Lower Lake ports in a paper prepared by himself and E. H. Dresser, chief engineer.

Besides these general papers, one dealing with the drilling of the very hard ore and rock at the famous Soudan mine was presented by W. P. Wolff, chief mining engineer for the Oliver Iron Mining Co. in the Vermilion district; and Prof. John A. Searles, of the University of Minnesota, recounted the progress made in the flotation of Mesabi wash-ore tailings. Mimeographed copies of a preliminary report entitled "Ferromanganese-Grade Concentrates From the Cuyuna Range," by S. M. Shelton and M. M. Fine, were distributed. In the evening an informal dinner-dance was held at the Northland Country Club.

A fleet of ten new Greyhound buses were the means of transport furnished the visitors for seeing the Mesabi. The party proceeded first to Coleraine, at the western end, visited the Oliver company's Trout Lake concentrator and, after a picnic lunch near by, inspected the operations in the Cleveland-Cliffs Canisteo pit, equipped with trucks and conveyor line, and the Inter-State Iron Co.'s Hill-Annex pit, which uses standard-gage electric haulage. The night was spent at Hibbing.

Here, that evening, the visitors enjoyed a dinner given in the magnificent Memorial Building, with J. Wilbur Van Evera acting as master of ceremonies. The speaker on this occasion was Prof. W. G. McBride, of McGill University, president of the Canadian Institute of Mining and Metallurgy. An exhibition of skating was provided for the entertainment of the diners, whose tables were arranged in tiers about the ice rink.

On the morning following, visits were made to the truck-equipped Albany pit of Pickands, Mather & Co., the great Hull-Rust pit of the Oliver company, which mine uses steam railroad haulage, also diesel-electric locomotives; and to Republic Steel's adjacent Susquehanna mine, which is equipped for Differential haulage. After stopping at Virginia for lunch in the Recreation Building there, the party inspected the tower excavators and truck haulage in the Oliver company's Spruce pit, from which the ore is removed by a conveyor system which is partly underground.

Returning to Duluth, the male members of the party concluded their junket to all practical purposes with a dinner-smoker at the Kitchi Gammi Club, other appropriate entertainment having been prepared for the ladies, as on several occasions also earlier in the meeting.

IRON COUNTRY

Large Ore Shipments Going by Rail

About 300,000 tons expected to be shipped to consumers in Central States to speed delivery

Marquette Range

▶ Cleveland-Cliffs Iron Co. has contracted with the Koppers United Co., Granite City, Ill., for delivery of 80,000 tons of Marquette range iron ore to be shipped all rail from the Maas mine, Negaunee, Mich. Gondolas are being used for transport instead of conventional ore cars. The Koppers Co. is reported to have contracted for 300,000 tons of Lake Superior district

iron ore. This volume will be the largest all-rail shipment ever recorded in the district.

The Cliffs Power & Light Co. will undertake to improve storage capacity of Deer Lake to increase the power supply to its mines, now operating at capacity. The power company, meanwhile, has been buying current from the nearby producers.

Menominee Range

▶ John E. Johnson, Milwaukee regional director of the National Labor Relations Board, withdrew charges recently against the Verona Mining Co., that the company dominates the Independent Mine Employee union of the James, Buck, and Bengal mines. The charge against the mining company, a subsidiary of Pickands, Mather & Co., was filed by local 1624 Steel Workers Organizing Committee, a CIO affiliate rejected by the employees of the three mines during a representation preference poll conducted by NLRB last October.

▶Pittsburgh Coke & Iron Co. recently purchased from the Mineral Mining Co. a 35-year-old stockpile containing 20,000 tons of ore from the old Beta property, at Mineral Hill, Mich.

Gogebic Range

▶ Diamond drilling is under way at the Wakefield mine, operated by the M.A. Hanna Co., near Crystal Falls. Some ore is still being shipped from the pit, but the company is preparing for underground operations.

TRI-STATE

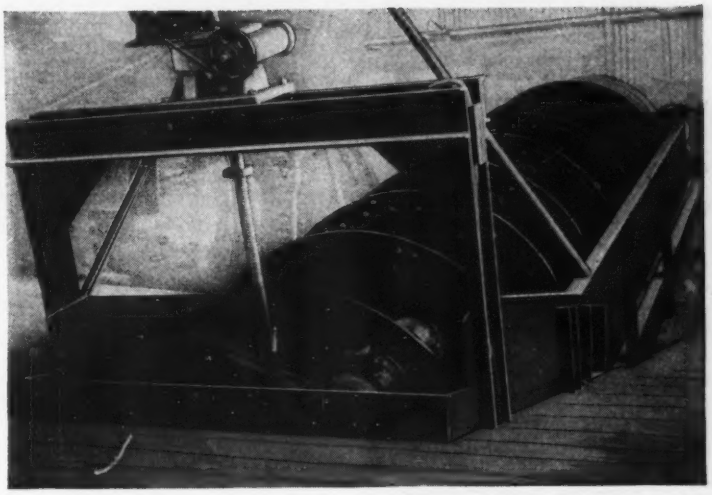
Volume of Zinc Output Continues Unchanged

Mine development lags and some properties are gradually depleting ore reserves under present frozen price for zinc

▶ Production of zinc concentrates in the Tri-State district during August averaged around 9,500 tons weekly, and, on the basis of the prevailing price, the output for the remainder of the year will do well to continue at that rate. New production expected soon is that of the Federal M. & S. Co. properties at Granby, which are being rehabilitated. The ore price now has been stabilized at $48 a ton for nearly a year. New development is practically at a standstill, with producers faced with increasing costs, and, in most instances, with decreased ore reserves. Another factor is the labor supply, which may be drawn upon by the higher wages of defense projects—an army cantonment near Neosho, Mo., an ammonia nitrate plant near Riverton, Kan., and a powder plant at Choteau, Okla.—with which a majority of the mine operators will be unable to compete for skilled, or semi-

METALS FOR DEFENSE

FACTS ABOUT SAVING TIME



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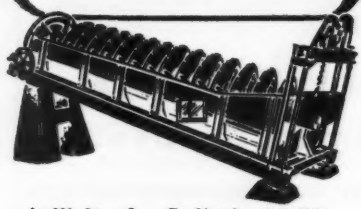

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▶TRI-STATE

skilled, labor on the present ore price. With the latter problem uppermost in their minds, officials of the office of price administration and civilian supply sent Dr. J. D. Sumner, of the federal agency, and J. L. Bruce, a special consultant, into the local mining field during the third week of August to make a first-hand survey of the potential zinc output of the mining district in relation to price and with due consideration to costs and other operating problems. District operators are patiently awaiting the result of their findings, which they hope will mean new mining activity and prolong the life of the field.

▶ In addition to the new Snapp mill of the Kansas Explorations, Inc., near Oronogo, two other mills—the Youngman mine mill on the Robinson lease northwest of Treece, Kan., and the Harris Mining Co.'s mine plant near Aurora, Mo.—recently have been placed in operation and a third mill, that of the High Grade Mining Co. at Chitwood, northwest of Joplin, is scheduled to get in production early in September.

▶ Eagle-Picher M. & S. Co. dewatered the Oronogo mines flooded last spring after 14 weeks of pumping operations, and Fenix & Sons are completing preparations to resume mine operation at the Oronogo Mutual No. 5 shaft. Dewatering of the old Galena mining area by Fred Childress & Sons is progressing about on schedule. Federal M. & S. Co. has dewatered the Mascot shaft, in the Granby area, with only a few feet of water in the ground at the Klondike No. 4.

▶ United Zinc Smelting Corp. is sinking a new shaft on the Long Hunt lease, a mile north of Quapaw, and Fenix & Martin have started a new shaft on the LaTosca lease, at Oronogo. Oldham Mining Co. is reopening a shaft on the old H., H. & H. lease, a mile northwest of Baxter Springs, and the Lula Bell Mining Co. has moved a steel derrick and 400-ton hopper from the Eagle-Picher Pelican lease to the old Anna Beaver mill shaft near Cardin.

▶ Nibeck Mining Co. has taken over the properties of the Mary Arnold Mining Co., near Ozark, Mo., according to C. W. Nicolson, of Miami, manager for the Beck Mining Co.

▶ A rich strike of zinc ore in the old Aurora zinc and lead mining area has been reported by Billy Hunter in churn drilling near the Aurora hospital. The strike was made at a depth of 180 ft. A rich run of blende also has been encountered in a shaft started last May by R. H. Leach, of Joplin, and associates on the Connor Investment Co.'s land near Central City. Ore was struck at a depth of 68 ft. and continue to the 83-ft. level.

▶ C. P. Vancil, of Joplin, and associates of Colorado, have purchased the old Zinc-Lead Producers mill at Chitwood. The mill has been dismantled and is being rebuilt on the James Kirk land, an 80-acre tract a mile and one-half north of Duenweg, in the old Porto Rico mining area. The group, which will operate as the Little Sallie Mines, are making preparations to reopen an old shaft near the north-central part of the south forty and to sink one or more shafts along the eastern boundary.

MEXICO

Sonora Graphite Deposits Being Developed

Prospects for production appear favorable —Government urged to lower taxes to permit greater mining of metals for export, required by United States defense program

▶ Copper and graphite mining is looking up in Sonora. Cananea Consolidated, Cananea, and Moctezuma, Pilares de Nacorazi, have increased their activities and augmented their working personnel. Graphite production prospects have become so good in Sonora, thanks to war conditions, that the federal government and some unnamed private interests are planning to establish treatment plants for that metal in that region, according to the national commission for stimulation of the mining industry. The commission expects that Sonora will soon come to the fore as an exporter of graphite to the United States. Sonora, eager for new industries, has just enacted a law which exempts such enterprises from all taxes for ten years.

▶ Several sectors of the industry are urging the government to cut production and export taxes, to implant a more equitable mining productions tax evaluation system, reduce railroad freight rates, and to provide more adequate transportation facilities as a means of helping the business. Unless such assistance is rendered promptly, Mexico will not be able to take advantage of the great opportunity that the war is affording, even that of assured sales to the United States under the recent economic defense agreement, for mining is now almost entirely limited to high-grade ore, gold and silver. Difficulties in obtaining heavy machinery and equipment for the industry continue.

▶ Mexican mining showed no appreciable improvement as fall approached. Labor difficulties were still to the fore, with Peñoles, faced with a strike at all its five units, two refineries and three extraction groups, and Kildun, whose properties Federal troops are guarding to prevent threatened sabotage by disgruntled workers.

▶ Renovation of laws governing the Federal mineral reserves and an examination of all tracts in these reserves has been started by the ministry of national economy with the intent of assuring equity in incorporating lands, rational exploitation of these zones and to free them of tracts that are of little if any mining value.

▶ Mining enterprises in the Federal District and adjacent zones served by the Mexican Light & Power Co., Ltd., now have sufficient electric power, as copious rains and the action of the federal

government have relieved the acute current shortage that obtained in this sector last winter and spring.

▶Troubles of Kildun, Matehuala, San Luis Potosi, J. J. Pope, general manager, have increased with the warning by the labor ministry that it will be fined 1,000 pesos ($215) every time it fails to send a representative to conversations the ministry is conducting with the national miners union in an effort to settle work difficulties resulting from the company's petition for sanction to suspend operations for the duration of the war. Kildun contends that business is so bad that it is impossible for it to function at a profit. Troops are guarding Kildun's properties to prevent sabotage certain of the radical workers threatened.

▶Cia. Fundidora de Fierro y Acero de Monterrey, S. A., Monterrey, Nuevo Leon, Mexico's greatest iron and steel works, has started marketing through the Banco Nacional de Mexico, S. A., 7,500,000 pesos ($1,615,000) worth of its mortgage bonds to finance the purchase and installation of a blast furnace, which with the present furnace, the only one of the kind in Latin America, is estimated to triple production, which last year was 93,000 tons. The new furnace is to be in service about the end of next year or early in 1943.

▶Road and railroad constructions the federal and states governments have started assure mining in several regions, particularly the center, west, and northwest, better transportation facilities. Mining is included on the technical commission the federal government has organized to cooperate with it in formulating a national social insurance law that is to be presented to the new congress in September.

▶Work has been resumed at properties of the Cia. Minera El Fenomeno, S. A., Rosa de Castillo, Baja California, after a short strike which ended when the labor ministry induced the miners to accept arbitration of their grievances, alleged violation of their contract.

▶An upswing in gold, silver, copper, mercury, and graphite production during the first quarter of this year over the output in the same period of 1940 is shown in the following comparative tables of the Ministry of National Economy for the two terms, amounts in kilograms:

Product	1941	1940
Gold	7,398	5,897
Silver	711,688	641,886
Copper	13,543,379	10,551,997
Lead	48,826,276	61,833,992
Zinc	20,728,681	20,785,379
Antimony	3,073,827	3,162,724
Graphite	3,704,981	2,602,072
Mercury	208,402	70,649
Arsenic	2,474,994	2,084,569
Cadmium	138,023	208,425
Tin	41,201	63,762
Molybdenum	148,416	243,518
Iron	14,291,847	17,430,054
Vanadium	.....	9,886
Manganese	43,690	86,112
Bismuth	29,882	53,412
Tunsten	17,975	15,660
Coal	181,773,197	220,149,835

Though the war has deprived Mexico of many markets for her mining products, leaving the United States by far the greatest customer, it has developed such new outlets as the Argentine and the Union of South Africa for some Mexican metals and minerals.

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CANADA

Discovery Made at Arntfield Gold Mine

Vein 20 ft. wide cut on 775 ft. level—Hard Rock Gold Mines' 100-ton mill addition goes into operation

▶ The Dominion Bureau of Statistics reports Canada's gold output for May at 449,185 oz., compared with 443,199 oz. for the same month a year ago. Following is production by provinces, with 1940 figures in brackets: Ontario 271,174 (270,153); Quebec 89,884 (83,182); British Columbia 49,927 (53,483); Manitoba and Saskatchewan 23,692 (22,342); Northwest Territories 5,726 (4,014); Nova Scotia 2,795 (1,827); Yukon 5,986 (8,185) oz.

QUEBEC

▶ The Quebec Bureau of Mines has issued its semi-annual report on gold production, showing that the 7 percent rate of increase is still being maintained. In the first half of 1940 the output was $19,147,320 in Canadian funds, advancing to $20,532,935 in the six months ended June 30, 1941. Silver output was at a record high, up 40 percent above last year.

▶ A major discovery has been reported on the 775-ft. level of Arntfield Gold Mines by H. L. Donaldson, mine manager. At the No. 2 shaft altered agglomerate was cut, indicating a grade of $5.66 a ton across a true width of 20 ft. A length of 96 ft. has been developed, with both ends open. It is planned to start crosscuts on the 925 and 1,075 levels. This is the second of three ore zones that were located several months ago in drill holes. This outstanding development was reported two weeks after the death of Fred S. Arntfield, who discovered the property in 1923, financing and developing it to production almost single handed—a rare achievement in Canadian mining history.

▶ Francoeur Gold Mines, adjoining Arntfield on the north, has increased the capacity of its cyanide mill within two years from 180 to 400 tons a day. For the first seven months of this year the average grade has been $7.45, against $7.27 for the same period in 1940. John Knox, Jr., is mine manager and Alderson & MacKay, Inc., are consulting engineers.

▶ A reduction in costs at Sladen-Malartic Mines is announced by the general managers, Futterer & Reid. In the second quarter the mill treated a smaller tonnage, resulting in production of $202,008, down from $204,085 in the first three months. Development work has started directly under the No. 2 shaft on the telluride zone that has been found to represent a considerable body of $4.25 ore. The mine manager is R. R. Basserman.

▶ Early assurance has been had by O'Brien Gold Mines of the downward continuation of the high-grade ore in the main No. 4 vein. Drifting on the new 2,125-ft. level is proving up to expectations, and drifts on the 2,250, 2,375, and 2,500 levels are just now getting into the rich sections of the ore that has been remarkably persistent from surface down to 2,000 ft. A year or more will be required to develop the new block of ground, but the presence of fine to coarse gold at this stage of the program is taken as evidence that the vein pattern developed below the 1,500-ft. horizon will persist down through the four new levels.

▶ A mill increase of upwards of 200 tons by midsummer is planned for Siscoe Gold Mines, located near Val D'Or, northwestern Quebec. This step follows the rapid increase in ore reserves within the last three months, estimated at more than 700,000 tons. Since 1929 the Siscoe has produced $18,000,000, and with the working out of the new ore theory there is promise of greatly extending the life of the mine.

ONTARIO

▶ Berens River Mines reports that favorable developments are taking place in the program of work at depth that started last year, with substantial ore lengths on the 650, 800, and 950 levels. The last statement of ore reserves showed 110,000 tons, grading 0.31 oz. gold and 16.4 oz. silver to the ton, down to the 560-ft. level. The mill is treating about 7,500 tons monthly.

▶ High-grade, free-milling ores are being treated by Hard Rock Gold Mines in the 100-ton mill addition that went into operation in August. Located at the No. 2 shaft, about 10,000 tons of development rock from the dump at No. 1 shaft has been moved over for treatment, and development work advances on the south zone, 500 ft. of ore carrying coarse visible gold.

▶ An internal shaft is to be put down below the 2,050 level at Central Patricia Gold Mines as soon as extensive preparations have been completed. A crosscut 350 ft. long has been run out to the site of the shaft, excavations have been made for the hoist and compressor rooms, and the shaft collar has been sunk 18 ft.

BRITISH COLUMBIA

▶ Surf Inlet Consolidated Gold Mines, Ltd., produced 15,063 oz. gold, 4,969 oz. silver, and 181,358 lb. copper, valued at $595,577, from 4,396 tons of concentrate obtained from 39,643 tons of ore milled during the fiscal year ended June 30, 1941. In spite of an increase in the value of production of almost $100,000, the net profit declined to $66,354 after all charges except income taxes, compared with $122,393 after all charges in the previous year. The decrease is accounted for by the cost of the most extensive development and exploratory campaign in the history of the company.

▶Hedley Mascot Gold Mines, Ltd., reports production valued at $46,473 from 16,886 tons during the quarter ended June 30. Average heads were 0.351 oz. gold per ton and net earnings before depreciation and depletion amounted to 2.04c. per share. W. B. Farris is president.

▶A gold strike at Shulaps Mountain, in the Yalakom River area of the Bridge River district, has attracted field engineers of exploration companies and prospectors in large numbers. The original discovery is credited to four graduates of the University of British Columbia, S. Wilson, J. Soppit, T. Illidge, and W. White, who staked claims in the area last fall. Located at an elevation of 5,000 ft., the area is very difficult of approach. Bralorne Mines, Ltd., has taken an active interest in the area and is reported to have acquired several claims. Amendments to the British Columbia Mines Act at the last legislative session, which prohibit blanket staking of areas, have caused a larger number of prospectors to be on the ground than would formerly have been necessary. Holders of free miner's certificates may file on eight claims only on one vein or lode. Previously a prospector could file on eight claims for himself and stake as agent for others and thus cover a whole region if necessary.

▶During the quarter ended June 30, Granby Consolidated Mining, Smelting & Power Co., Ltd., made a net operating profit of $126,044. The grade of ore shipped averaged 1.227 percent copper, compared with 1.312 percent during the first quarter of the year. Additions are now estimated to have increased the ore reserves to 17,220,729 tons with an average shipping grade of 1.32 percent. A dividend of 15c. per share (U. S.) will be paid Sept. 2, subject to the approval of the Foreign Exchange Control Board.

▶As a result of the acquisition of the Big Star property and the large expenditures necessary to develop and equip it for production, directors of Spud Valley Gold Mines, Ltd., have passed the dividend that normally would have been paid in July. Dale L. Pitt is in charge of operations.

▶Howe Sound Exploration Co., Ltd., with registered office at Britannia Beach, B. C., has been granted an extraprovincial license in British Columbia.

▶The annual report of Sheep Creek Gold Mines, Ltd., largest of the Nelson district producers, shows estimated ore reserves at 128,611 tons, averaging 0.372 oz. gold per ton on May 31. Zincton Mines, Ltd., wholly-owned subsidiary, which was incorporated in October, 1940, to take over and operate the Lucky Jim lead and zinc property, is milling 175 tons of 14.5 percent zinc ore daily.

▶The annual report of Reno Gold Mines, Ltd., Nelson district, shows production valued at $242,688 for the six and one-half months in which the mill operated. Total production to April 20, 1941, is $5,271,220. Ore reserves (positive) are estimated at 1,800 tons averaging 0.33 oz. gold per ton and 200 tons averaging 0.25 oz., with reasonably assured ore of 4,200 tons averaging 0.25 oz. W. S. Ellis is general superintendent.

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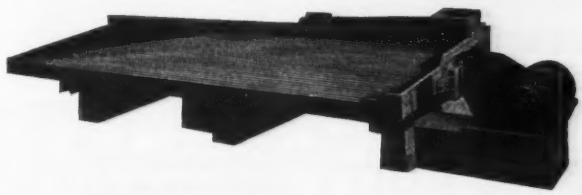

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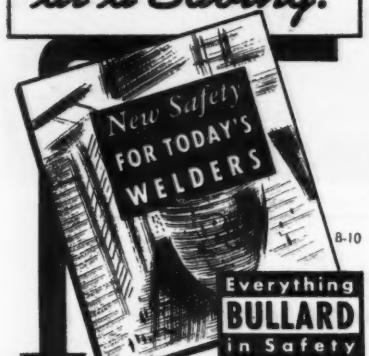

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SOUTH AMERICA

Canadian Commission Visiting Latin America

Peru, Chile, Argentina and other countries on the itinerary—Chilean Government helps small miners—Higher export tax on copper proposed by Chile

▶ Seeking to improve commercial relations with Latin American countries, a Canadian Trade Commission left Ottawa in late August to visit Central and South American countries. States to be visited first will be Venezuela, Ecuador, Peru, and Chile, on the West Coast. Later the mission will go to Argentina, Uruguay, and Brazil. Trade and Commercial Minister James A. MacKinnon heads the mission.

CHILE

▶ The Caja de Credito Minero, created by the Chilean Government to develop the natural resources of the State and provide small miners with financial aid for equipment, reports increasing gold production. The following summary indicates the results of these operations:

Year	Tons Ore	Gold oz.
1937	64,978	48,570
1938	100,962	72,500
1939	128,273	100,000
1940	138,494	115,650

Among the mills established by the Caja de Credito Minero are three cyanide plants at El Salado, Elisa de Bordos, and Domeyko for treating gold ores containing no copper. Five flotation plants have been built for treating gold and copper ores. These are at El Salado, Punta del Cobre, Inca de Oro, Carrizalillo, and Punitaqui. The cyanide plants employ the countercurrent decantation method and the Merrill-Crowe system is used to precipitate the gold from solution. Lack of fresh water at the El Salado cyanide plant forces use of salt water, which has 15 percent sodium chloride content. This presents some difficulties, chief of which is to thicken the slime of oxidized ores. (limonite) that produces a muddy overflow. On the other hand, quartz ores present no problem with salt water, as this does not prevent solution of the cyanide nor the formation of a soluable compound for the gold. Precipitates from all the mills are smelted in Chile and delivered to the Casa de Moneda or mint.

Among the flotation plants, the one at El Salado uses salt water. This requires more reagents, causes corrosion of iron parts (which is being partially solved by use of wooden replacement parts), requires a high dilution in the clarification to obtain the necessary fineness, and takes a longer time to dry concentrates.

A department in this organization called the Credito y Fomento maintains a staff of mining engineers who visit the properties that have been advanced a loan so as to help the operators with any technical problems. This department also has charge of the leasing or selling, under an installment plan, mining machinery and supplies to the small miner. The machine shop at Inca de Oro servicing the miners' equipment has been enlarged recently. Supplying fresh water to the mills is being studied.

▶ Ore from small mines whose production does not justify construction of a mill, or is not of sufficient high grade to be shipped to the United States or European smelters, is bought for treatment by one of 33 purchasing agencies between Iquique and Rancagua. The Caja de Credito Minero buys high-grade ores for export in competition with foreign purchasing agents who have been in this business in Chile for a long time. Profits which the Caja Minero may obtain shall be only sufficient to finance running expenses of the organization.

▶ The Chilean Government has presented a bill to tax metallic copper exports 22 centavos per kilogram of bar copper. This is equivalent of about 2c. a pound. Funds collected from this tax would finance a three-year health and public works program as "compensation" for the war's effect on Chilean economy.

AFRICA

Development on West Rand Holds Promise

Three ounce gold ore found in depth in the Blyvoors property—Operations started at Western Reefs mill

▶ The Transvaal (Witwatersrand) gold mines set up still another all-time output record in May. Production was 1,219,068 oz. The previous high record was 1,211,277 oz. made last October. As another important mine (Western Reefs) started production on June 28, it is to be expected that still higher output records will be achieved by the district before this year ends.

▶ An outstanding development has occurred in this West Witwatersrand area. It is in the Blyvooruitzich Gold Mining Co.'s property, which is some 15 miles west of the Venterspost and Libanon mines, so is distinctly West Rand. The first of the two deep shafts being sunk by Blyvoors intersected the so called Carbon Leader at a depth of 4,685 ft. and found it contained 2 oz. of gold per ton over a width of 27 in. That occurred last March, and at the time it was thought that an exceptionally rich spot may have been encountered. But during shaft cementation making it necessary to discontinue sinking for a period, a drift was extended for a distance of 200 ft. Over the 185 ft. of this distance which has been sampled and measured the reef averages 72.4 dwt. per ton (unreduced) over widths averaging 16½ in., or approximately 3¾ oz. After the shaft is completed—it has 80 ft. further to go—this development will be resumed. This reef extends through the company's property for a distance of between 3,000 and 4,000 ft. The diamond-drilling results which led to the sinking of the shafts had given promise of a rich mine.

▶ The reduction plant of Western Reefs, which has just been put in operation, has a capacity of 100,000 tons monthly. This

company was incorporated eight years ago and so far represents an over-all expenditure of £4,500,000. It is understood that during the next five years Western Reefs will be exempted from the normal mining taxation, but will be liable for the special South African war contribution of 16 percent of profits. Sir Ernest Oppenheimer has already intimated that a considerable increase in the capacity of the present plant is in mind for the future.

▶A bad rock burst at the Simmer & Jack mine, one of the oldest producers in the Witwatersrand, occurred June 19 in the vicinity of the Rhodes vertical shaft. There were no casualties, but the shaft was badly crushed between the 34th and 36th levels. Production was reduced somewhat while repairs were made.

▶East Geduld Mines has raised its ore reserves to 15,200,000 by including blocks of low grade which have become profitable because of the higher price of gold. Its reserves average 5.2 dwt. over a width of 57 in.

AUSTRALIA

Small Miners Continue To Receive Assistance

Close to 5,000 oz. gold recovered from their operations in 1940—Placer and lode deposits in Solomon Islands being prospected

▶It is the practice of the governments of all Australian states to assist prospectors, either financially, by the hire of equipment, the free assay and examination of ore samples, or by rebates on the cartage of ore to State batteries for treatment. Since the inception of the scheme in 1933 the Department of Mines in Western Australia has given aid to 8,608 men and 330 were receiving assistance at the end of 1940. During the year 1940, 10,082 tons of ore raised by assisted men was milled for a return of 4,492 oz. of gold, which refunded £A7,760 to the department. Since the scheme was brought into operation, the total ore crushed amounted to 73,018 tons, which yielded 36,014 oz. of gold: the expenditure in assistance was £A260,852 and refunds were £A50,195. In 1940, the mining industry was assisted by the State to the extent of £A40,264 and in 1939 £A47,459 was made available.

VICTORIA

▶Wattle Gully Gold Mines, N. L., situated at Chewton, continues to be one of the largest and most consistent gold producers in the State. Exploratory work is in progress below No. 10 level, from which a winze is being sunk, but has not advanced sufficiently to give information on lode extension. The large orebodies occur on a west-dipping fault cutting east-dipping beds of an anticline and at No. 10 level the fault is in close proximity to the fold, or center country. The problem of interest is whether the

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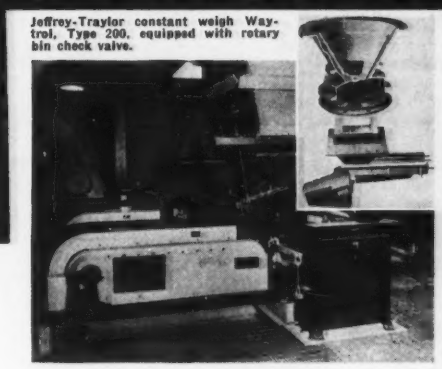

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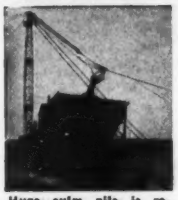

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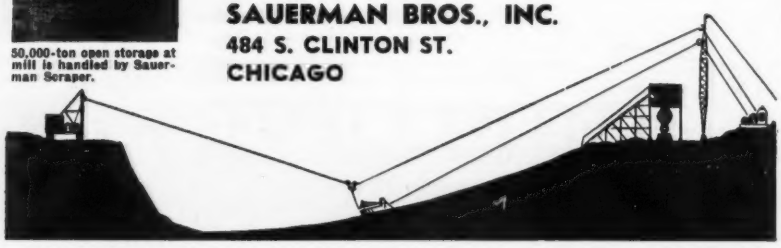

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▶AUSTRALIA

fault will pass across the west-dipping beds of the anticline or will continue as a bedded fault. Either alternative will have an important bearing on the future of the mine at depth.

WESTERN AUSTRALIA

▶ Great Boulder Proprietary Gold Mines, Ltd., at Kalgoorlie, has issued a report covering operations for the quarter ended March 31, which shows that the general rate of production was maintained. In the period, 105,499 short tons of ore was treated for a yield of gold to the value of £A227,676, the total working costs, including ordinary development, amounting to £A168,279. The company is continuing an active development policy on seven levels.

NEW GUINEA

▶ The history of Bulolo Gold Dredging, Ltd., operating at Wau, over the period of nine years from April, 1932, to April, 1941, is one of exceptional progress. During this period, the company has compiled the following record of production:

Ground dredged, cu. yd.....	105,892,650
Gold bullion won, oz.....	1,714,431
Gross value of production....	£A9,970,848
Working profit	£A6,728,250

Reserves of alluvial ground amount to 164,627,000 cu.yd. The company is operating eight electrically driven bucket dredges. Four are equipped with 10-cu.ft. buckets, two with 10½, one with 6, and one with 11-cu.ft. capacity buckets. The 11-cu.ft. dredge has a digging depth of 85 ft. and a monthly capacity of 220,000 cu.yd. The average throughout per dredge is 7,306 cu.yd. per day. Working costs, exclusive of amortization and gold tax, are 8.39c. per cubic yard, or 12.59c., including taxes. The total output for 1940 was 18,353,000 cu.yd. for a return of 268,108 oz. of bullion containing 185,016 oz. of gold and 81,567 oz. of silver, the average value of the ground being 4.862 gr. fine gold per cubic yard. The average gold value of the ground treated since the inception of operations is 5.651 gr. All transport to the field is by air and to May 31, 1940, the company's aeroplanes have carried 34,000 short tons of machinery and supplies from the seaport to the mine without any loss or damage.

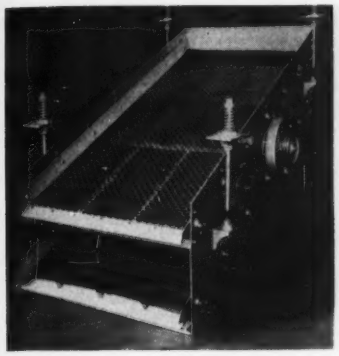
SOLOMON ISLANDS

▶ Extensive prospecting by a group composed of the Emperor and Loloma mining interests, which control the two important gold mines in Fiji, are in progress in the British Solomon Islands. Good alluvial ground is being worked by prospectors and the new group proposes to explore for extensions of such ground and for the lodes from which the gold has been shed. Operations are being carried out at the invitation of the Administration and a large area of country is held.

EQUIPMENT NEWS

New Vibrating Screen

DENVER EQUIPMENT CO., 1400 17th St., Denver, Colo., announces its new Denver-Dillon vibrating screen for metallic and non-metallic ores. The unit is said to be unique in that it applies the principle of circle-throw action. It consists of a screen body eccentrically



mounted on a concentrically rotatable shaft and is carried on four spring-cushioned rubber-insulated suspended rods, which relieve the shaft and bearing of load strain and shock. The screen is said to assume its full-floating, true-circle vibration, in absolute static and dynamic balance. Standard machines are equipped with four suspension rod assemblies and necessary brackets for fastening to any substantial structor supports. Normal duty screens are available in sizes from 1x2 ft. to 4x10 ft. Heavy-duty types start at 4x8 ft. and the maximum size reaches 6x10 ft.

Car Holder

A NEW SAFETY BLOCK or car holder designed for holding trips on bad grades, is announced by the Portable Lamp & Equipment Co., 78 First Ave., Pittsburgh, Pa. The device is said to be small and light in weight, and can be placed in position for use in a very short time. In operation, the safety block is placed on the rail next to either a wood or steel tie. When the car wheel strikes the holder the device rests against the tie for support. Units are available in two sizes, for 20- to 25-lb., and for 30- to 35-lb. rails.

Pan Filter

WESTERN MACHINERY CO., 762 Folsom St., San Francisco, Calif., recently announced its new pan filter, for use in batch operations. The pan is filled with the concentrate to be filtered. Vacuum and gravity action is then applied and the cake left in the bottom is said to be easily removed. Dumping is caused by revolving the pan on its central axis trunnion. The units are said to be of sturdy construction and simple to operate. Four sizes are available, from 3x3 ft. with one pan, to 4x4 ft., employing two pans. Filter area ranges from 9 to 32 sq.ft., requiring from 1 to 2 hp., respectively, to operate.

Conveyor System

LINK-BELT CO., 307 N. Michigan Ave., Chicago, Ill., announces the development of a new power-operated conveyor system for the positive and continuous conveying of crushed or ground materials. The system is said to employ an especially designed chain to which solid peaked-top flights are rigidly attached at every pitch. These divide the material in the conveyor duct into a continuous series of batches, which are moved positively by the peaked-top flights, whether there be full load or only a partial load. These conveying units are said to be applicable for horizontal, inclined, vertical, or curvilinear directions. Chain speed is from 10 to 80 ft. per minute and capacities of materials of non-corrosive and non-abrasive nature range from 1 to 140 tons per hour.

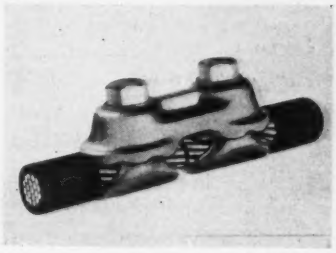
New Cap Crimper

A NEW BENCH-TYPE cap crimper is announced by E. I. duPont de Nemours Co., Wilmington, Del. The machine is said to make two smooth continuous internal beads on the throat of the cap. These beads are said to grasp the cover of the fuse so closely that a waterproof seal is made without the use of a waterproofing compound. The unit can be adjusted to clamp any commercial blasting cap now on the market. A fused cutter and a guide which holds the fuse in line with the blade, insuring a square cut, is also provided by the machine. The crimper may be operated by foot as well as by hand. Dimensions of the unit are 4½ in. at the base, height 10 in., and weight 10 lb.

Dings Magnetic Separator Co. offers the above photograph to demonstrate the strength of its newly designed high-tensity double-gap rectangular suspended magnet. The young lady is suspended merely by the attractive force of the magnet for the steel wheels in her roller skates.

Cable Connector

BURNDY ENGINEERING CO., INC., 459 E. 133d St., New York, announces a connector for use on cables. Known as the Versi-Link E.R. type, the unit



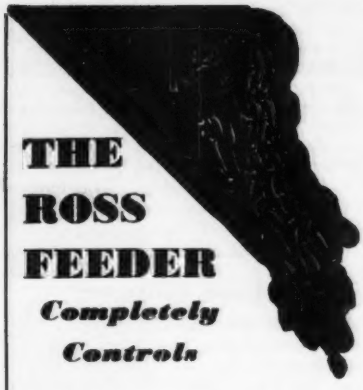
may be used to join copper cable conductor on end or parallel to each other, or at an angle. The swivel principle of the connector is said to permit cables to be inserted in either side from several different angles and rapidly clamps the cable in that position. Connector sizes are available for cables ranging from No. 8 solid to 1000 MCM.

For Boiler-Water Treatment

A NEW technical rust-removing product entering the boiler-water treatment field is "Baerite," an organic treatment produced and serviced by the Water Treatment Company of America, 1159 Hodgkiss St., Pittsburgh, Pa. This new product is said to have been developed to a state of perfection which eliminates all "chemistry" on the part of the user but providing complete water treatment in a single liquid which requires no other additions. The manufacturer states that Baerite rapidly removes all scale and rust from boilers, prevents pitting, corrosion, and further formation, and completely eliminates the cause of foaming and priming. The company is said to be establishing a boiler-treatment service in key cities that will provide immediate attention to all boiler requirements.

New V-Belt

THE DAYTON RUBBER MFG. CO., Dayton, Ohio, announces a new type of V-belt with a unique driving surface for either flat pulleys or V-grooved pulleys. This belt, marketed under the name of Dayton-Cog belt, is said to be designed around a new type of cog-construction principle on the inner surface of the belt. Construction is said to provide greater flexibility and longer belt life when flexing around small pulley diam-



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eters, but for V flat drives it applies the principle of increasing traction by means of a non-skid design. When riding in grooved pulleys this new belt is said to provide greater gripping power with die cut raw-edged sides which present the same undistorted driving surface to the pulley regardless of the side wear. The belt is being manufactured in all standard lengths in A, B, C, D, and E cross-sections and in matched sets for multiple drive service.

Portable Acetylene Generator

A NEW portable acetylene generator for use in oxy-acetylene welding and cutting has been announced by Linde Air Products Co., a unit of Union Carbide & Carbon Corp., 30 East 42d St.,

New York, N. Y. Known as the Oxweld MP-10, the unit is said to deliver 30 cu.ft. of acetylene per hour and is suitable for welding metal up to $\frac{3}{8}$ in. thick, and for cutting steel up to 5 in. thick. It is designed for maximum portability, from a standpoint of weight and height, and can readily be moved about the shop or away from the shop for outside jobs. Generation of acetylene is started, set for regular operation, and stopped, by rotating the single pair of operating handles at the top of the generator. Once the operating handles have been set, generation of acetylene proceeds automatically. The MP-10 is strongly constructed of welded steel parts. It weighs only 100 lb. when empty and 250 lb. when charged, and measures only 3 ft. $2\frac{1}{2}$ in. in height.

New Coupling

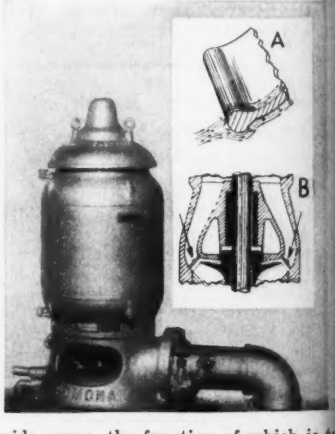
THE FALK CORP., Milwaukee, Wis., announces the addition of a new coupling to its line of Steelflex couplings. The new unit is said to be especially adaptable for use in horizontal and vertical pumps and exhaust draft fans, and permits greater flexibility in locating the driving and driven units. The coupling consists of two hubs, one of which carries an internal flange to which the cover is secured, a special tempered-steel member, forming a complete cylindrical grid member and flange steel cover secured to the hub flange with capscrews. Three types of couplings are available, single piloted, double-pilot horizontal, and double-pilot vertical.

Air Circuit Breaker

WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa., announces a newly designed air circuit breaker for repetitive duty, for use in industrial central station for power plants. Known as the DK breaker, it is available in 50,000 and 25,000 amp. interrupting capacities in all standard current ratings from 50 to 600 amp., for operation on 1, 2, 3, or 4-pole, 600-v. a.c. or 250-v. d.c. circuits. The new breakers are said to be equipped with rotary type removable operating handle for controlling the breaker manually. In addition, electrical operation can be provided by a motor mechanism for a shunt trip. The motor-operating mechanism is a self-inclosed unit in itself. It can be moved by taking out only three bolts. Main contacts are of silver alloy and employ a self-wiping action. "De-Ion" arc quenchers minimize burning on the main and arcing contacts. These breakers are available in four different forms: an open type and three forms for inclosed application. The standard inclosed breaker consist of an open-type unit mounted in a sheet-metal housing. Available accessories for these units include oil suction, magnetic, or thermal-magnetic overload trip units, which are adjustable for minimum trip.

New Pump Design

THE POMONO PUMP CO., Pomona, Calif., announces it has been granted patents covering design improvements which eliminate hydraulic losses in pumps. These improvements are said to increase efficiency as much as 10 percent and are now included in all sizes of Pomona vertical turbine pumps. Design changes involve alterations in the



guide vanes, the function of which is to alter from horizontal to vertical the flow direction of fluids being pumped. Previous practice in pump manufacture dictated that these vanes can be constructed as thin as possible on the advance edge, on the theory that the less metal the fluid would strike the less would be the resistance encountered.

It is not necessary for the owner of vertical turbine pumps to purchase a complete new pump in order to take advantage of the new design. Insert above, "A" bulbous-shaped end of guide vane; "B" cross-section of bowl assembly.